CHRONIC BRONCHITIS
IN NEWCASTLE-UPON-TYNE

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IN
NEWCASTLE-UPON-TYNE

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1957

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CHAPTER I

INTRODUCTION

It is now commonplace to say that the face of medicine is changing, and changing fast. It is, however, none the less true. The position of tuberculosis is that most prominently before us at the present time, but the same process is at work in other fields, and not least in non-tuberculous respiratory disease, both among children and among adults. The acute respiratory illnesses are now so dealt with that they occupy much less of our attention than they did; and, furthermore, certain chronic respiratory diseases such as bronchiectasis and chronic suppurative bronchitis, with their complications, are largely prevented.

Clinical treatment and medical attention is thus being directed to an increased extent to congenital disorders, and to those chronic diseases which have been unaffected by these changes.

Among such chronic diseases chronic bronchitis presents an outstanding problem. Medical treatment of the established condition is, of course, now effective up to a point. The introduction of anti-biotics has provided the doctor with an important weapon. Much difference of opinion exists as to how these remedies are best used in chronic bronchitis, and the problem is, of course, a difficult one.

The *prompt* and *vigorous* treatment of each and every exacerbation, whether it shows itself merely as a chest cold or as a more severe illness, is probably the most effective method. No attacks, however minor, must be allowed to escape. As Krüger said "The best time to kill a tortoise is when he sticks his neck out". For this, the patient requires to be regularly under the care of his own doctor with an occasional visit to hospital for the purpose of consultation, and admission in all severe relapses.

When all is said, however, the very best that can be expected from treatment of the fully developed condition is a slowing-down of the progressive changes in the lung, and prevention of

many of those sudden deteriorations from which the patient never seems to recover fully.

Prevention, or treatment at a much earlier stage than is now practicable, seems to offer the only hope of a real advance.

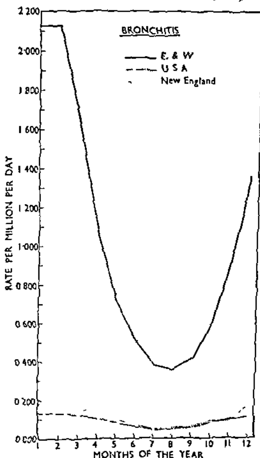


Fig 1

Third in importance as a cause of death, chronic bronchitis is probably first as a cause of disability, if one may use this term as an expression of loss of working time. 25·6 million working days were lost from bronchitis in the year 1953–54 (Min. P.N.I.), 20·3 of these by men—more than a tenth of the 187 million working days lost altogether. These figures have altered little since 1951.

These facts are well-known, but may not be widely appreciated What is, perhaps, even less realised is the extraordinary differences in mortality rates which exist as between one country and another. All these rates are quite possibly underestimated as many bronchitics may be certified as dying from heart failure.

The figures were given, however, by Lewis-Faning in his classical report to the Medical Research Council in 1940. Two diagrams from that report (Figs. 1 and 2) will sufficiently illustrate this point.

It should be noted that there are two differences in the comparative graphs. Not only is the total mortality in England and Wales on the average 1.1 times that in the United States, but the seasonal mortality also shows very wide differences. It will be observed that during the summer the death rate in England and Wales is little more than twice that of the U.S.A., whereas in winter this rate is 1.5 times as great.

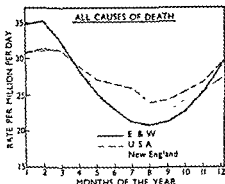


FIG. 2

Standardised death rates per day in each month

The United States is not the only country with which our mortality from bronchitis can be unfavourably compared. The figures below are from Scandinavia, and were quoted in the Report of the Committee on Air Pollution.

TABLE I

Death rates from Bronchitis per 100,000

	Year	*Males*	*Females*
Denmark	1951	2.2	1.0
Norway	1931	5.5	3.5
Sweden	1951	5.0	4.0
England and Wales	1951	107.9	62.7
Do	1952	83.8	42.0
Do	1953	91.9	47.8

(Reports on Public Health and Medical Subjects No. 95, 1954.)

If we turn to the United Kingdom more particularly, however, *it becomes evident that there are wide differences of mortality* within it. These differences are not as great as are those between England and Wales and the United States of America, but they are considerable.

Table II is based upon the Registrar-General's figures and shows the high mortality of Manchester and Tyneside, as compared with the West country.

TABLE II

Bronchitis deaths 1954: *Rates per* 10,000 *per year.*

Area	*Age* 45-64		*Age* 65-74	
	M	F.	M.	F.
Tyneside conurbation	10·9	1·9	38·8	16·7
S E Lancs conurbation	17·1	4·6	76·8	24·1
S Western Region	5·9	1·0	30·2	6·5
England and Wales	*9·8*	*2·0*	*43·5*	*11·3*

There are thus three main problems for solution, in connection with chronic bronchitis:—

1. Why is it so much more common, or more fatal, or both, in England and Wales than in the United States of America?
2. Why is there such a tremendous seasonal swing in mortality in England and Wales; a seasonal swing which is moreover absent in America?
3. Why is mortality within the United Kingdom so much higher in large towns and industrial districts than it is in rural areas?

Of these, the third is the most important, as from the answer, or answers, to it the others might well become capable of solution. Thus, the facts, as they are so far known, indicate that chronic bronchitis is predominantly a social disease, despite the essential role of infection.

Social inquiry, and medical community studies are both relatively recent developments, but the study of the social indications of chronic bronchitis would have been impossible in any event had it not been for the great advances in the

understanding of its nature which have been made by the *contributions* of Oswald (1953), Reid (1953) and May (1952) from the Brompton Hospital. Oswald's clinical study of 1000 cases of the fully established disease, Reid's clear, coherent, and convincing account of the morbid anatomical features, and May's careful study of the role of the infection, have together given us a firm basis on which to work.

Prior to these studies, one hundred and fifty years of clinical recognition, since Badham (1808), had yielded nothing of importance apart from the association of the disease with pulmonary emphysema

The clinical importance of emphysema, and its significance in the mortality figures, have been pointed out by Fletcher (1952), Flint (1954) and Fulton (1953); and the work of Christie (1944) has shown us how emphysema first cripples and then kills

We are now on firmer ground in planning field surveys, and are stimulated further by the recognition of the value of antibiotics and other treatments in chronic bronchitis

The principles of such population studies have been established in this country by workers in the Pneumoconiosis Research Unit in South Wales, in particular Fletcher (1951), and Cochrane (1952). Stuart-Harris and his colleagues (1954) have already begun to apply these to the study of the prevalence of the symptoms of bronchitis in a selected community. The long-standing interest of the Sheffield School in the problems of bronchitis is well known and the maintenance of this tradition by Pemberton (1952) and others has thus been further reinforced. In these circumstances, an attempt to survey an industrial city, with the object of ascertaining the prevalence of the disease, and the significance, if any, of certain environmental factors, seemed to be appropriate

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Chapter II

PATHOLOGY AND PATHOGENESIS

The sole advance made in an understanding of the nature of chronic bronchitis prior to the end of the late war in 1945, was its relation to emphysema and to heart failure. The tendency was to regard the disease as degenerative, and part of the process of ageing.

During the past 5 years, however, the situation has been transformed by the studies of Reid (1953, 1955) on the morbid

a disease with morbid anatomical and other features of its own, and not a degenerative process. It is, of course, true that clinicians had for some time recognised its intimate association with infection, but as an entity it was somewhat intangible and elusive.

The essential morbid anatomical change has been shown to be a chronic obliterative bronchiolitis which, by its nature, leads to emphysema as it extends. Many bronchioles are obliterated, others are fibrotic, tortuous, and inflamed, with consequent partial obstruction due to mucosal swelling and secretion. Hence the inevitability of distension of the lobules to which access of air is still possible, and the likelihood that the respiratory demands of heavy exertion will hasten and intensify this process.

The radiological study of chronic bronchitis made by Simon and Galbraith (1953) demonstrates clearly the condition as it exists in the living patient.

The mention of secretion in a previous sentence introduces the other main abnormality, namely, excessive mucus production with hypertrophy of the mucous glands and gross dilation of their ducts Duprez and Mampuys (1953) devoted special attention to this aspect, and described degeneration of mucous tissue in advanced cases.

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This secretory abnormality is obviously a clue of the greatest importance in relation to pathogenesis, and is likely to give a lead to aetiological studies, if it be interpreted aright. Whether this mucous activity is initiated by an infective process or by other means, or perhaps by several factors varying in importance in different cases, it is readily to be understood how it would favour both the persistence and spread of bronchial or bronchiolar infection.

The normal mucus of the air passages is, of course, necessary, but its excess is harmful. Ciliary action, the main scavenging process of the lung, is hampered and tends to be bogged down, with resulting stagnation. Infecting organisms are thus retained, and find a fairly favourable nidus for colonisation. They are able thus to maintain themselves in comfort, and also to maintain by their irritative action the excessive mucus production which is hindering their evacuation from the lung. The continuous sheets of mucus also tend to favour the spread of infection within the bronchial system.

That the infection which is implied by the above changes exists and persists in chronic bronchitis has been shown by Mulder and May, who have demonstrated the organisms concerned, and their relative importance. a tremendous service to the clinician in these days of anti-biotics

Mulder finds Haemophilus Influenzae in 80 per cent. of sputum and in pure culture in 50 per cent. He finds pneumococci in only 25 per cent. May's results are similar, although he noted pneumococci alone in 20 per cent. and relatively more frequent generally in relation to Haemophilus than did Mulder. Mixed infections seem to occur in 30 to 40 per cent. of cases, but the organisms found are still mainly the Haemophilus and the Pneumococci The Staphylococcus makes rather a poor third in point of frequency, and other pathogens are rare

Stuart-Harris has devoted his attention to the pneumococcus rather than to the haemophilus and finds this orga[illegible] rather more frequently than the other observers (195[illegible] h[illegible] however, studied the bacteriology more from t[illegible] of pathogenesis (1955).

He and his colleagues have made ob[illegible] of pneumococci by chronic bronchiti[illegible] strongly suggest that the " chest c[illegible]



FIG 3



FIG 4

... of the anterior segment of the upper lobe from a

[facing page 8

episodes from which more than 70 per cent. of bronchitics suffer and which are responsible for deterioration in their general health to such an extent, are not correlated with new bacterial infection. The presence of bacteria in the sputum is interpreted as suggesting an individual abnormality which allowed of the establishment of colonies of pneumococci (and presumably of other micro-organisms as well) in the bronchial system.

The observation of Mulder (1953) that the virus of influenza can damage the mucosa and promote the entry of Haemophilus Influenzae deep into the bronchial wall, is of much interest in this connection, although evidence of virus infection in bronchitics is so far slender. Stuart-Harris has found no evidence as yet to support a view that bronchitics were harbourers of virus infection (1953) though influenza virus infection was found in association with exacerbations of bronchitis in a number of cases

Some reference must now be made to the physiological effects of emphysema, and their influence on the life and death of the sufferer.

As has already been mentioned, distension of the lobules served by healthy or relatively healthy bronchioles takes place to a greater and greater degree as bronchiolar obliteration extends throughout the lungs. This reduces the available surface area of the lung considerably and to an increasing extent, although actual over-all measurements of a whole lung are extremely difficult to achieve. Duguid (1956) has carried out measurements in emphysematous lungs by section and has struck an average for the whole lung in each case He has shown a reduction of over 30 per cent in ventilatory surface area in quite moderate emphysema, and has obtained much higher figures in individual sections.

The strain on the right heart to which this leads, a strain which steadily increases over the years, and is never completely relieved, establishes a precarious balance for the emphysematous bronchitic person, who is always on the edge of serious oxygen unsaturation. That this is so, despite the near or normal levels which are maintained, is shown when a chest cold causes a sudden diminution of pulmonary ventilation with cyanosis and acute respiratory distress, and perhaps a dangerous respiratory

acidosis which may arise within an hour or so; a dramatic change to be produced by such a mild respiratory illness.

Eventually congestive heart failure signifies the beginning of the end, even though the end may be delayed for some years by medical care.

Chronic bronchitis as a cause of congestive failure is second only to ischaemic heart disease, if one may judge by admissions to hospitals, as seems reasonable.

Flint found that Cor Pulmonale accounted for 40 per cent. of cases of congestive failure in men in the Sheffield hospitals and of 9·5 per cent in the case of women; an over-all figure of 25 per cent

In a survey of the Newcastle region which has just been completed by one of us (A.G.O.), Cor pulmonale accounted for 26 per cent. of all admissions for congestive failure into those hospitals with adequate recording systems (which included the main hospital groups). The disease associated with Cor Pulmonale was in nearly all cases chronic bronchitis.

Figures for the sexes, separately, have not been given as the intention is simply to emphasise the importance of chronic bronchitis as a cause of congestive heart failure.

Paul Wood (1950) gives the incidence of Pulmonary Heart Disease as 5-10 per cent. of organic heart disease. This suggests that in London the problem is a less important one, possibly due to a lower prevalence of bronchitis.

This brief account of pathology has necessarily been concerned mainly with post mortem findings, and this is liable to leave the impression that this is the whole of the subject. These morbid anatomical findings were earlier referred to as obliterative bronchiolitis, and it would be a great convenience if some such name could be brought into use. It would indicate that the disease process had reached a stage which was irreversible and progressive.

The term "chronic bronchitis" could then be applied to all cases of persistent bronchitis, many and probably most of whom would not go on to the terminal phase just mentioned.

This will be referred to in detail in the next chapter, but it was felt necessary to make reference to it here.

Chapter III

DEFINITION AND RECOGNITION

Chronic bronchitis, confidently diagnosed day by day, a recognised throughout the United Kingdom as a major cau of death, has not so far been found to be susceptible of clini definition To-day, 150 years after Badham first gave it name, there is no general agreement as to the criteria for recognition. The confident diagnosis of an experienced doct is generally accepted, and indeed, in the fully developed ca no real difficulty exists. But the disorder is not clear c shading off in its earlier and less severe manifestations into t inchoate bronchial " catarrhal " states which have no recognis name or significance as yet.

This situation cannot be regarded as satisfactory from a point of view, but when information is to be sought as to origins and causes, it becomes an acute dilemma.

One cannot rely solely on the personal opinion of any doct in a field survey, unless his criteria of recognition are clea stated It is fairly certain that no such set of criteria would generally accepted at the present time, and yet it is increasing felt that studies of prevalence and aetiology cannot be postpon indefinitely As has already been stated, several such stud have in fact been carried out, although often without claim th they refer to chronic bronchitis specifically

In these circumstances, the only possible course is to set a clinical definition, so that both those carrying out the wo and those studying the results, may clearly understand what meant

This is what has been done in the present instance. Ve careful consideration has been given to the terms of t definition, and the possibility, indeed the probability, th chronic bronchitis varies very widely in severity, and that t early stages of the disease may differ in certain respects fr the picture presented by the hospital out-patient, has been ke

prominently in view. Such a chronic, though widely varying, disease must start somewhere, gradual though its development may be, and probably is. A point must be reached in every case at which we are to recognise that the disorder exists. The aim has been to cover the whole field of persistent bronchitis, and not only the fully developed and partially disabled cases.

The typical history of chronic bronchitis must be considered if this point is to be made clear.

This history varies in duration, but tends to be long rather than short. It is one continuous story, but falls naturally into two parts.

The first is usually the longer, and consists essentially of persistent cough with sputum, which may be limited to the winter months in the early years. The individual may be slightly breathless and may have an annual chest cold, but is not otherwise incommoded. The thing is a nuisance rather than a disabling complaint, and medical advice is often not sought at all

Then, perhaps following an acute chest illness, or perhaps for no obvious reason, a change in the character of the condition occurs. Cough and sputum become more troublesome, chest colds more frequent and more severe, and constant and increasing breathlessness is experienced.

Once this stage is reached, the general experience is that the condition is progressive although the rate of progress may vary considerably. Eventually increasing disablement due to extending emphysema leads to heart failure, unless an acute respiratory infection should cause earlier death, or the patient should die of some other disease such as coronary thrombosis or malignant disease. It has to be remembered that these patients are often in the age group for cancer by the time they reach the later stage of chronic bronchitis.

The significance of all this in relation to the present problem is that during the first stage it is probable that the changes are potentially reversible.

If the case is a mild one, or if circumstances are or become favourable, arrest or healing may occur. Once the second stage is reached, however, obliterative bronchiolitis is present and extending, and the condition is likely to be irreversible and progressive.

This conception of the disorder was in mind when the clinical definition to be adopted was decided.

When aetiological factors are to be studied, all cases have to be included, and not merely the more severe ones which probably form less than half the total.

A wider definition than would fit the hospital case is therefore necessary, and it was fully realised that this would lead to a high prevalence figure. It has therefore seemed advisable to give a detailed explanation of the reasons for this wide definition, so that misunderstanding may be avoided

With these points in mind, certain criteria have been erected into a definition, as follows:—

"For the purpose of this inquiry, chronic bronchitis is recognised as a long-standing condition, the essential features of which are cough with sputum, persistent through the winter or throughout the year, in the absence of other causative respiratory disease A minimum duration of two years is [illegible]"

[illegible] "breathlessness" [illegible] [illegible]rly or less severe case may well be excluded The significance of dyspnoea in this connection was also thought to be difficult of interpretation in some cases.

The final diagnosis has depended solely on the satisfaction of the above criteria once other respiratory disease was excluded as causative by physical and radiological examination

On the other hand, there is a risk that if all persons liable to "chest colds" without persistent symptoms are accepted, many allergic and other catarrhs may be caught up, thus leading to confusion

Persistence of the symptoms was the guiding principle throughout. For example, a type of person was frequently met with, who says that he (or she) has a cough with sputum from time to time "When I smoke", "When it is foggy", or "When it is cold", or on other occasions. If in such cases both cough and sputum were ascertained to be definitely present daily for a minimum period of three months in the winter of the year, or for longer, the diagnosis was chronic bronchitis On the other hand, if the symptoms were found to be intermittent with clear intervals, or to occur only two or

three times a week, or less often, the case was excluded. Considerable and careful persistence in questioning is often necessary in this work before a clear answer is obtained, but if the questioner knows exactly what information he seeks a convincing answer can be secured. It is, of course, essential that the examiner be *ignorant of the initial ascertainment.* (See Chapter V.)

No attempt was made to grade dyspnoea, but use was made of Fletcher's questions (1952) as an aid in determining the existence of breathlessness in a doubtful case. Grades 2 to 5 were regarded as constituting breathlessness.

The diagnosis of chronic bronchitis is also liable to be complicated by *association with other respiratory disease.* In some cases the presence of such disease will preclude the diagnosis, but in others the two conditions may obviously co-exist. For example, the fact that a chronic bronchitic also has a carcinoma of the bronchus has not precluded the diagnosis; neither has the presence of an obviously recent tuberculous infiltration. In a case of short duration (2 years or so) doubt might perhaps arise, but we met with no such cases.

When the presence of active tuberculosis was established, with obvious healing changes and fibrosis, the diagnosis of chronic bronchitis was ruled out; but the presence of an old healed tuberculous scar has not been regarded as significant.

Without pre-judging the possibility that chronic bronchitis may arise, in many cases at least, upon an allergic basis, it is obvious that *bronchial asthma* itself must be recognised and recorded either separately or as a condition associated with bronchitis.

A clear history of intermittent attacks, or persistent gross wheezing on clinical examination usually made the diagnosis obvious. The diagnosis "*other things*" was applied in cases of other respiratory diseases with or without bronchitis.

Bronchiectasis gave the greatest trouble in differential diagnosis, bronchography being impracticable. Profuse expectoration of purulent character is unusual in chronic bronchitis, and this, together with an onset in early life, were the main features recorded as indicative of bronchiectasis. Local clinical and radiological signs were usually present in such cases, and clinched the diagnosis.

When serious doubt existed, the verdict was given in favour of bronchiectasis.

Six diagnoses were made.

1. Chronic bronchitis.
2. Chronic bronchitis with asthma
3. Chronic bronchitis with other things
4. Asthma
5. Other things
6. No bronchitis.

It is felt that the problem of recognition was solved satisfactorily by the methods employed, in accordance with the clinical definition used.

It is perhaps necessary to refer to the reason for our decision to exclude all persons in the sample who were less than 30 years of age. We are not concerned to deny that chronic bronchitis occurs below this age, but we believe that the labour involved in its discovery would not be adequately rewarded by the yield. We were encouraged in this belief by the figures of Clifton (1954) who found, on average, less than 5 per cent of persons below 30 who had persistent cough with sputum.

CHAPTER IV

NEWCASTLE-UPON-TYNE

The City of Newcastle-upon-Tyne lies along the North Bank of the river, occupying a stretch of $8\frac{1}{2}$ miles, as the river flows.

It extends northwards from the river, the furthest boundary being $4\frac{1}{2}$ miles away, and the nearest $2\frac{1}{4}$ miles. The shape of the city is roughly rectangular, with two northward projections. (See Fig. 5.)

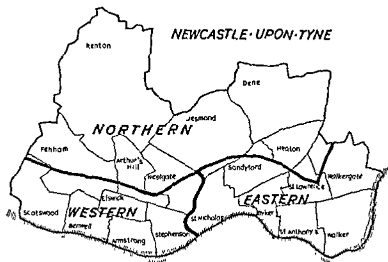


FIG. 5

Map showing ward boundaries, and indicating the 3 areas into which the city was divided for the purpose of this report (see text)

In the past the houses were crowded along by the river and it is only since the turn of the century that a really considerable proportion of the citizens have lived at any distance from it. Even now, more than half of them live within a mile of the north bank.

Rehousing has been actively pursued, and has tended to move people from the centre to the periphery. This has not always meant moving them further from the river. (See Appendix A: Table I.)

In order to clarify the position and to facilitate reference, the city has been divided by a line one mile from the river, drawn from East to West, into two main areas, "Riverbank" and "Northern". The riverbank area has been subdivided into "Eastern" and "Western" areas for convenience by the boundary between Stephenson and St Nicholas (see Fig 5) This division was not exact, as it was, of course, impracticable to split wards, each of which had to be allotted *in toto* to one area or another. *Nevertheless, the 1-mile boundary line, though* chosen simply in order to demarcate an area adjacent to the main source of industrial pollution (the banks of the river) was found to divide the city remarkably well The map illustrates this; and it will be observed that only one Ward lies awkwardly, namely the Westgate Ward The line passes through the middle of this Ward, but as the Northern half is largely made up of parks and open spaces, and by far the greater part of the population lives in the Southern half (*i e.* that nearest to the river), it was considered that it properly belonged to the "Riverbank" area (Western)

It is of interest to compare the density of population within the 3 areas, though in order to do this rather more than 1,500 acres must be subtracted from the Northern area to allow for the Town Moor and for agricultural land which is not available for building. When this has been done, the following result is obtained

TABLE III

City of Newcastle-upon-Tyne
Density per acre, 1955

Area	*Acreage*	*Population*	*Density per acre*
Western	1,701	86,250	51
Eastern	2,511	97,230	39
Northern	4,504	97,520	22
Totals	8,716	281,000	32

It is clear that the Western area has by far the greatest density of population, and also that the riverside area as a whole is twice as densely populated as the Northern area. This is of particular interest when the topography of the city is considered. (See Fig. 6.)

The North bank is steep from Scotswood to Stephenson, and again east of the Ouseburn valley as far as Byker, beyond which it flattens out. The South bank, although rather flat at its Western end, slopes steeply opposite Stephenson, St. Nicholas and Byker, and also further East.

There is thus a winding and rather narrow river with steep banks along much of the city frontage. These physical conditions are often regarded as favourable to atmospheric pollution and here exist in close proximity to the main sources of such pollution: heavy industry, electric power stations, and a large railway centre. The railway crossing is one of the largest in the world, and lines carry the east and west traffic along the whole of the city frontage, by the river side.

It might therefore be expected that the "Riverbank" areas, which have been shown to have the greatest density of population, would be exposed to the full effect of industrial pollution in addition to that of the domestic grate: whereas the northern area, stretching out beyond the top of the slope, would be less affected in this way, and would suffer mainly domestic pollution.

This supposition is supported by the observation of the citizens who, knowing the city at all times of the year, come to distinguish a "sooty dirty" district from a "clean" one.

It seemed that as a distinction was readily made by ordinary observation, a contrast might well be revealed between one district and another, if chronic bronchitis were related to atmospheric pollution. This consideration played its part in the choice of the city as the subject for the survey.

It was, of course, recognised that too much must not be made of this and that any contrast could hardly be a really striking one. The distinction is after all one between bad and very bad. The older inhabitants of Kenton and Fenham have watched the pall of smoke extend northwards with the new housing estates. We take our pollution with us when we move.



Fig 6

[facing page 18

The Town Moor is in a "clear" district, but if one were to recline on it in white flannels, or to rub one's hand over the grass, it would immediately be appreciated that the whole of the city is quite heavily polluted.

Newcastle is in fact an old industrial city, and the "coaly Tyne" has been for long a proverbial expression.

CHAPTER V

PREPARATION AND ORGANISATION

ONCE it was decided to attempt the survey, the problems of definition, of ascertainment, and of organisation, presented themselves The question of definition and recognition has just been considered, and the method of dealing with it described.

At first, it was decided to use panel cards, and the co-operation of the principals in a fairly large practice in the East End of the City was sought. Their help was willingly given, and panel cards were studied until 100 presumed bronchitics were discovered. 100 "controls", or presumed non-bronchitics, were chosen by a random method, and all were visited by Health Visitors who collected certain social information, and these controls were later examined.

This experiment was carried out in April and May, 1954, and proved very fruitful The misconceptions which it removed, and the errors of approach which it exposed, were invaluable. One of these misconceptions was the idea that panel cards could be used for this purpose. It became only too clear that ascertainment must be made at the door. Apart from this, the chief lesson learned was the need for the fullest consideration of every detail, and the most complete preparation, before the start of any large-scale project of the kind.

The smooth running of the survey was very largely due to the experience gained in this experiment.

The account of the organisation which was set up is, of course, purely factual, and perhaps gives an inadequate idea of the time and labour involved in its creation. In actual fact, nearly 4 months were occupied in preparation, from the day on which the organising secretary started work until the day when the first visit was paid

One very big and time-consuming preliminary operation consisted in obtaining from every doctor with patients in the

city (over 200 in all) his or her written consent to the investigation and examination of any of his or her patients who might be caught up in the sample.

In addition, the formal and unanimous approval of the Newcastle Division of the British Medical Association was obtained, and all doctors in the city were asked by the Division to support the inquiry among their patients

This entailed a personal explanation of the objects and limits of the investigation to every doctor, and a pledge that any important or unexpected finding would be communicated direct to the practitioner.

To estimate prevalence, a random sample of the whole population was required The city of Newcastle was in the throes of a rehousing programme, and this meant that there was no complete list of persons It was decided to take as a frame of reference (following Yates, 1949) the private houses listed in the Voters list, supplemented by a list of new buildings erected before mid-1955 A systematic sample of 1 in 40 of the houses was taken, and within each house every occupant over the age of thirty was interviewed Thus the basic sample was intended to represent the population of the city who dwell in private households and were aged thirty years or over at the time of the first visit Permanently vacated houses (awaiting demolition) were excluded, but the Health Visitors returned later to any which were found to be temporarily unoccupied. This basic sample of 3,685 people should contain the correct proportion of people in 1, 2, 3, etc -person houses; an important factor in the design of any socio-medical survey in which the effects of heredity, nutrition or cross infection may be relevant. In a number of the houses there were several households, and all of these were included in our sample.

The inquiry was conducted from a central office, and we were fortunate in securing the use of a very suitable room in the Medical School in Queen Victoria Road, opposite the hospital. An organising secretary was appointed, and the appointment of an assistant was envisaged.

The active co-operation of the Health Department of the City was available, and it was decided to seek the help of the Health Visitors, 43 in number, each working in her own district In this way, the work would be evenly spread, the people would

be approached by someone whom most of them knew, or knew of, and any errors of observation would tend to cancel out.

There is, perhaps, a natural doubt as to the ability of Health Visitors, trained originally for somewhat different work, to conduct a social inquiry of this sort. Their daily work, however, brings them in constant touch with the people in their own homes, and enables them to gain a fairly intimate knowledge of their lives and environment; and in Newcastle the Health Visitors have experience of field work. They have for years conducted social enquiries in tuberculosis, and nutrition, and a number of them were engaged for 2 years in the early stages of the *1000* Families Study. (Spence *et al.* 1953.) In fact, the Health Department of the City has for some time been active in the field of social inquiry.

It was felt that the importation of professional social workers from outside might arouse prejudice which could more than destroy any possible advantage of their superior training In the North, at any rate, unwilling information is apt to be inaccurate information.

The proceedings were begun by a general meeting with the Health Visitors, when the objects of the survey were explained, and an account of the actual work entailed by it was given. Their help was then requested, and all willingly agreed to give this.

Following on the preliminary meeting, a series of group meetings were held, at which the inquiry form was considered in detail, questions were asked and answered, and suggestions were noted Eight of these meetings in all were held, and afterwards a list of the more important questions together with the answers given was circulated to all concerned.

Finally, shortly before the visiting began, another general meeting was called at which these were discussed and any further queries dealt with.

Each Health Visitor was given a complete list of all the households she was asked to visit, and it was left to her to select the order in which she did so. She was also provided with a supply of the following:

Introductory letters.
Household cards.
Return visit cards.

Inquiry forms.
Report forms.
Appointment cards.
Appointment lists.

Every Saturday, the Health Visitor posted introductory letters to the households she intended to visit during the coming week. The initial visit to the household was made for the purpose of ascertainment, and every member aged 30 or over was interviewed, on occasion, 9 or more visits were necessary. At this stage, 3 questions were asked, and the Visitor was strictly limited to these:

(1) Have you a cough—or a smoker's cough ?
or a winter cough?

(2) Have you phlegm?

(3) Have you had cough and phlegm for 2 years or more?

A definite negative to any or all of these questions was regarded as excluding bronchitis, while a positive answer to all was taken as presumptive evidence of bronchitis.

In the case of the presumptive bronchitic, the inquiry form was, if possible, completed there and then. In the case of the presumptive non-bronchitic, an intimation was given that such help might be needed

The household card, giving the address, the names, age and sex of each member aged 30 and over, and indicating the "bronchitics", was also completed These household cards were deposited at the local Welfare Centre, and were collected every week by the secretary, who thus knew not only the presumptive bronchitics, but also the presumptive non-bronchitics ascertained. The presumptive bronchitics were matched with presumptive non-bronchitics, comparable in age and sex, chosen by a random method in batches at fortnightly intervals. The secretary paid weekly visits (at least) to each centre when the Visitors were given their list of "controls" to visit, completed forms were collected and any queries dealt with. It was then the duty of the Visitor to return to the household concerned, and to complete the form for the presumptive control exactly as for the presumptive bronchitic. This procedure was, no doubt, slightly cumbersome, but no

be approached by someone whom most of them knew, or knew of, and any errors of observation would tend to cancel out.

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Household cards.
Return visit cards.

visit the Infirmary. In addition to the equipment already mentioned, every Health Visitor carried with her a small scribbling block, marked "Report". The purpose of this was to enable the Visitor to attach to the inquiry form, after completion, any queries or explanations, or any additional information which could not be given on the form itself. This proved most valuable.

Every inquiry form was discussed and checked by the secretary with the Visitor concerned, who was questioned closely on each section, any queries or information on the report form being dealt with

By this means, doubts and uncertainties were cleared away, any errors which might have crept in were avoided, and confidence in the accuracy of the information was increased

Inquiry form. The inquiry form itself was a 4-page folder, stating the information which was wanted, in numbered squares. Numbers within the squares were arranged so that one, and one only, in each square was to be ringed

The objective was to cover the significant activities and environment of the individual adequately without making the queries too cumbersome or too irritating. In short, an "inquiry" and not an inquisition was our aim Elaboration beyond a certain point defeats its own ends, tending towards inaccuracy and lack of co-operation

The assessment of the domestic care was intended to give a reliable indication of the manner in which the available resources had been applied throughout life, to home comfort and care. This was one of the three points in which the Health Visitor's estimation rather than the individual's answer were asked for, and it was one which all Visitors were confident of assessing accurately and one which they were well fitted to assess by their daily experience

The "smoking" questions were always answered clearly and without hesitation or rancour. (Any suspicion of "snooping" was found to be most difficult to surmount, once it was aroused, and the avoidance of questions likely to arouse antagonism was a major object in designing the form)

Housing was regarded as a major environmental factor, and it was realised that if it was to be studied, this should be done as thoroughly as possible. At least two-thirds of the individual's

other way of ensuring matched random sampling of control cases was discovered.

After each form was completed, the person was given an appointment card and was requested to state which day and time would suit him to attend for examination. The appointment card included a space for an occupational history, and the individual was asked to complete it at leisure. The object of this was to make good any error or failure of memory which might have marred the accuracy of the answers just given concerning jobs These cards were later checked against the form itself with the patient when he attended for examination.

The examination sessions were held at the Royal Victoria Infirmary and much discussion was devoted to their timing. *Finally, three weekly sessions were decided upon, as follows:—*

Tuesday at 7 p.m.
Wednesday at 2.30 p.m.
Saturday at 10 a.m.

It was thought that the afternoon session, at a time when most shops were shut, would suit the women best, and that the others would appeal to the men. In fact, the Tuesday evening session was much the most popular, Saturday morning the least popular with both sexes, and women did not very greatly outnumber the men at the Wednesday sessions.

Transport there and back was offered for all who asked for it, and about 30 per cent. availed themselves of this offer.

The medical examinations were carried out by three examiners, all of whom can be said to have had considerable experience in the handling of patients. The examinations at the special sessions were made by Dr N. Cardoe and Dr G. Ismay, and they also carried out examinations in the home in many cases of persons who were for any reason unfit to attend hospital, or who were unwilling to do so.

Other examinations in the home were undertaken by one of us (A.G.O.) in the case of persons refusing examination, or refusing all information when this was requested by the Health Visitor. In these cases, x-ray examination, when agreed to, was carried out either by special arrangement at the Royal Victoria Infirmary, or at the mass x-ray unit at the Newcastle General Hospital in the case of a few persons who would not

Two categories were recognised. those who had spent at least half of their life in one house and who were referred to as "selected house" cases, and those who had not spent as long as half of their life in any one house and for whom a "composite" house was constructed from the details given on the form. The method used is explained in detail in Appendix B.

In classifying the housing locality atmospheric conditions of soot, damp and fog were recorded only when these were gross, and dampness was graded to distinguish between moderate and obvious instances (see Appendix G5)

As in the housing section, jobs which lasted for less than two years had been excluded, and up to four other jobs had been recorded, working backwards from the time of interview The patient's occupational history was treated in practically the same way as the housing, using the term "one job only" in this case to mean a job held for half of the working life, taken to start at 14 years. This group included those who had followed the natural upgrading within their occupation (e g. shop assistant to store manager; pit boy to coalface worker or deputy in the mines), and those who had kept the same occupation under several employers. Those people who had never stayed in one job, or one type of job, for as long as half of their working life were called "wanderers" and "composite" working conditions were constructed for them. Again, details of the method used appear in Appendix B.

As far as conditions of work are concerned, it is recognised that what to one person may be reasonable working conditions appear quite unsatisfactory to another. One of the advantages of discussing each form in detail with the Health Visitor was that the secretary was able to ascertain in greater detail than was possible on the form the type of conditions in which the patient worked. For example, the most common complaint was of "extremes of temperature", in the first instance; but when the Health Visitor discussed this and made it clear that what was meant was extremes of heat and cold in carrying out a particular job, it was frequently withdrawn Complaints of dust, fumes and dampness were recorded only if these were gross.

It was felt that it would be useful to record how much of the patient's life had been covered by the information recorded

life, and the whole duration of the disease, must be cove the great majority of cases, it was thought, if the results v have value; and yet an unduly complicated scheme wo likely to ensure inaccuracy.

Finally, it was decided to take 4 consecutive houses, had each been inhabited for at least 2 years, starting wi present house and working backwards. In this way, m was assisted and the present or most recent dwelling for useful standard of comparison. This was perhaps som of a gamble, but it was justified in the result.

The occupational environment was dealt with in the way, and with even greater success, as far as adequate was concerned at any rate.

The *questions in regard to both housing and occupation* designed to be simple and easy to answer correctly; and i thought that they covered the requirements adequately.

The medical section was designed rather as a mea *establishing the diagnosis and of eliciting possible* aetiol factors than as a clinical study of chronic bronchitis. A nu of clinical studies have appeared, and it has not bee intention to supplement these.

After each form was completed and checked, and afte clinical examination was completed, the examiner entere provisional assessment in the space provided and sign Later, at a special session, all the examiners studied each *together, discussing the case and arriving* at a final assess as has already been stated. The form was then ready for ed and finally for coding

It should be emphasised that none of the examiners at *time knew the initial ascertainment* made in any case by Health Visitor.

The final stage in dealing with completed inquiry forms the editing and coding of them. As has already been mentic each form was discussed in detail by the organising secr and the Health Visitor concerned, the secretary making --ditions which m

n a picture of

conditions of housing and work in which the patient had s his or her life.

CHAPTER VI

THE CONDUCT OF THE SURVEY

VISITING commenced on January 25th, 1955, and the last visits were paid towards the end of April 1956. The actual field work, therefore, occupied a period of 15 months, instead of the 12 months originally envisaged. Various factors contributed to this, the main one being a series of epidemics during the first winter and spring. These not only diverted the activities of the Health visitors, but caused a considerable amount of sickness amongst them.

It was, however, also the case that progress generally was rather slower than anticipated, largely due to full employment. Men, and women too, seemed to be working extremely long hours, including week-ends, and were often out when visited. As many as 9 visits might have to be paid to a household before all the members could be interviewed, and 6 was quite usual.

The majority of the persons caught in the sample were friendly and helpful, extra persuasion, such as a visit from a doctor, being required in about 13 per cent. These somewhat reluctant individuals mostly turned out to be control cases, as one would expect. It was difficult to explain to some persons why they should be approached and questioned. A number never understood the reason, but co-operated good naturedly to please the doctor. "There's nothing the matter with me," they kept saying. However, only 26 of the total of 3,866 persons refused all information, and of the 1,250 selected for detailed questioning and examination, 1,202 were actually examined. For various reasons it was impossible to complete the inquiry and examination for 14 presumptive bronchitics and 34 presumptive controls. Of these 48, 5 could not be found, and 43 refused the further assistance which was required. (Appendix C.1.)

A certain "lapse" rate is inevitable in field work, and the achievement of 96 per cent success over-all compares favourably with any other comparable investigation. The "control" cases

relating to his or her housing and occupation. This information was recorded in three categories:—

Over two-thirds.
One-third to two-thirds.
Less than one-third.

A separate record was kept of the housing and job coverage in relation to the duration of the disease, in the case of chronic bronchitis, and this coverage was complete in more than 90 per cent. of cases. (See Appendix B.)

Information concerning periods spent in the armed forces was only used when the individual had spent more than half his working life in the forces. The number of years spent was, however, recorded as part of the total coverage of occupation and housing. The number of years of unemployment (if any) was also included in the job coverage of the men and of any single women. In the case of married women, their husband's unemployment was recorded and so did not count in their job coverage.

The editing completed, the forms were then coded by occupation and social class, using the Registrar-General's Classification of Occupations. Categories for "Housewife" and "Wanderer" were added to this list of orders.

In the case of Housewives, the husband's job had been given and social class was graded on the basis of this. Where the husband had been dead for some time and the woman was not working, or where the occupation of the husband was not known, the social class was entered as "not known".

The information for each patient was then transferred on to Hollerith punched cards for analysis

observer error as between health visitors and doctors In Appendix C the figures of both studies are shown, and it will be seen that they are similar.

In Fletcher's experiment, the questionnaire was more extensive, but the conditions were easier, as the subjects were hospital in-patients. This makes a considerable difference, as will be appreciated by anyone who has done home-visiting in a field study. Whether it be possible to improve upon these results is unknown The experience of this inquiry suggests that until and unless the population becomes "conditioned" to such investigation, further improvement is impossible Whether it be for their ultimate benefit that they should be so "conditioned" is another question

As things are, three reactions seem to be important One is suspicion, one is fear, and the other is a dislike of "becoming involved" in anything. In a number of cases, these reactions were freely admitted afterwards by the persons concerned One man thinks his job may be threatened, despite the pledge of confidential treatment for all his replies Another has a fear of tuberculosis or other disease A number of persons told the Visitors later that they were glad they had finally agreed to take part in the survey, as it had removed this fear from their minds. A third enquires about procedure the "What am I letting myself in for?" attitude. On learning that medical examination and even x-ray are contemplated, he denies all symptoms. Some of these individuals were much taken aback when they "came out of the hat" as controls. With few exceptions they then became co-operative

For example, one of us (A.G O) heard one man roundly abuse his wife for "giving the show away". After detailed explanation and further reassurance, however, he talked freely and the interview terminated in a friendly spirit, with tea and cakes

Apart from any such attitudes on the part of the individual, however, to elicit from a member of the public even such an apparently clear-cut symptom as cough, or alternatively to ascertain that it is absent, can be an exacting exercise on occasion. It is, of course, essential to obtain an answer which carries conviction, if the case is not to be classed as an instance of refusal to co-operate A conversation such as the following

were more difficult, as has been mentioned already, but even there the figure of successful completion was 95 per cent., as against 98 per cent. for the presumptive bronchitics.

This aspect of the work may, therefore, be regarded as satisfactory and gives statistical reliability to the results. The question of the reliability of the actual information which was obtained must be considered next.

The necessity of entrusting to Health Visitors the initial ascertainment of chronic bronchitis caused some anxiety, as the reliable eliciting of symptoms is really a job for an experienced doctor. No doctor was available for this work and it was hoped that detailed instructions as to the procedure to be followed would minimise any deficiency. In particular, they were told to *include every person who owned to the required symptoms*, no matter what they happened to know of his individual history, and to notify all those cases in which any doubt existed. Any *wrongly notified* cases could, *of course*, be *excluded* on examination.

All notified cases are referred to hereafter as "presumptive bronchitics". The selected "controls", referred to hereafter as "presumptive controls", were examined to start with as a precaution. Had no error in ascertainment, or only a mild error revealed itself, the detailed checking and examination of the presumptive controls might have been discontinued.

As it was, however, a quite definite error became evident quite quickly, and it was decided to continue these examinations throughout the survey.

This defect caused other inconveniences, but these will be dealt with elsewhere

The object of giving the visitors *detailed instructions regarding* ascertainment was partly to avoid a variation in ascertainment from one district to another, as this would have gone far to vitiate prevalence figures, and would have affected other results as well This fear has not materialised, and a study of the records of the 43 visitors concerned in the survey has shown that the ascertainment has been uniform throughout.

This question of error as between one observer and another is a hindrance to research work of this kind. Cochrane *et al.* carried out a test of observer error in the case of doctors, and Fletcher (1955) has recently conducted an experiment *on*

did not sufficiently gain the person's confidence, his or her own doctor was asked to join in a home visit, and this was always successful It should be emphasised that, despite the value of a clear definition, the doctors concerned in the examinations should be men experienced in the handling of patients.

In view of the findings of Cochrane *et al.* (1951), it was necessary to see whether the doctors themselves differed in diagnostic standards, even though they were using uniform criteria In neither sex was there a significant tendency for one of the doctors to diagnose as bronchitic more of the presumptive bronchitics, nor to find more bronchitics amongst the presumptive non-bronchitics (See Appendix C.)

The numbers of men seen by the three doctors were similar to those seen by Cochrane's observers and it is felt that the specific questions for diagnosis helped to eliminate observer error. The conditions under which the questions were asked in this survey were possibly also more favourable

The eliciting of information regarding cough and sputum is not only normally a doctor's job, it is also, as has been explained, a difficult one. The procuring of factual information is on a different level, although confidence is still essential. It was considered that the Health Visitor of the district, whose daily work takes her into the homes and round the streets, and is in itself social, had the knowledge and experience to obtain this One of us (A G O.) has on a number of occasions, when previous refusal had necessitated a special visit to the home, listened to the social inquiry, and has been impressed by the care and patience exercised.

Details of occupational history are, no doubt, somewhat outside the normal range of the Health Visitor's social round, but this was really easy to obtain, provided that care was taken to check dates. The occupational history card which was incorporated with the examination appointment card was a valuable adjunct, as defects of memory could be made good, and the information made available when the card was handed in at the session

was not uncommon, and in fact was quite usual in the more difficult type of case.

Q. Have you a cough?
A. No, I have no cough.
Q. What? No cough at all?
A. Only the cough that everybody has—it's due to smoking.
Q. Do you cough every day?
A. Most days
Q. Are there any days on which you do not cough?
A. No.

This is, of course, only the beginning There is still the question of persistence during the day, during the winter, or during the year, and of the duration of the cough.

Expectoration was a symptom much more easily ascertained, although a few eccentrics gave somewhat bizarre accounts of their sputum

Breathlessness is considered in detail in the chapter on clinical findings. The use of Fletcher's questions, and the inclusion of all grades from 2 to 5, was a considerable help, and it was felt that reliable answers were obtained. The use of a single-breath ventilation test was introduced, but was abandoned because of inconsistent results in some cases The aged, the infirm, the obese, and the simple were apt to be incapable of producing reliable figures. As, moreover, dyspnoea was not essential for the diagnosis according to the criteria used, it was considered that the omission of this test could not affect our results. A further point which is relevant here is that the interpretation of the significance of the symptom was in a number of cases difficult or uncertain: although this is dealt with at length later.

It was the general experience that a person either refused completely or co-operated fully. Some needed additional persuasion, and usually a visit by a doctor, but once they decided to talk they did so frankly and freely.

Confidence between interviewer and interviewed is the secret of reliable medical information, and the doctor is in a much more favourable position in this respect than is the non-medical enquirer Furthermore, he is used to the job of eliciting symptoms. In cases where the medical officers of the survey

The majority of the bronchitics in each age group are found to be "unsuspected" bronchitics. Although less than a quarter of the people who told the Health Visitors that they had no cough and sputum lasting for 2 years were shown to have it by the doctors' examination, there were so many of these presumptive non-bronchitics that their contribution to the total was three times as great as that of the confirmed bronchitics.

This method gives estimates of the percentage total bronchitics in each age group, which when pooled (weighted by the relative numbers in the groups) gives an over-all prevalence of 36 per cent. in the whole male population aged 30 and over and 17 per cent in the female.

In the course of this estimation, which gives a prevalence figure for men of 36 per cent, with a standard error of approximately ±2 per cent., estimates of the age-prevalence have been obtained, but these are relatively unreliable, having standard errors of the order of ±5 per cent For example, the estimate for men aged 30-39 is 29 per cent., with a standard error of ±6 per cent, giving confidence limits of 17 per cent to 42 per cent. bronchitics

The reason for this very wide range of possible values for the age prevalence figures is that the percentage of "unsuspected bronchitics" is based on the small number of presumptive non-bronchitics examined. Forty-two were examined in the 30-39 year group, to provide matched controls for the presumptive bronchitics found in the group As the unsuspected bronchitics form a majority of all bronchitics in the age group, this "unreliability based on small numbers" is transmitted to the total prevalence for that decade.

Sex	*Age*					
	30-39	40-49	50-59	60-69	70 and over	*All ages over 30*
	%	%	%	%	%	%
Male { Method 1	29	39	41	34	45	36
Male { Method 2	31	35	40	40	39	36
Female	10	15	20	23	20	17

Fewer unsuspected bronchitics were found amongst the women, and the female age-prevalence figures are thus relatively

CHAPTER VII

THE PREVALENCE OF BRONCHITIS

The condition recognised as bronchitis in this survey was described in Chapter III. There it was pointed out that a high prevalence was expected because of the wide clinical definition employed, and the reasons for this were set down

It has already been pointed out that a number of the "suspects" found by the Health Visitors did not turn out to have chronic bronchitis after examination and assessment. Also a number of the population who passed the Health Visitors' screening questions were later found by the clinicians to have bronchitis, according to the diagnostic criteria used.

The principle of the estimation is as follows· in a sample of people, a proportion p per cent. are found to be presumptive bronchitics, the remaining $(100-p)$ per cent. being the presumptive non-bronchitics. Of the presumptive bronchitics, a majority, r per cent. have the diagnosis confirmed on examination, meaning that r per cent. of p per cent. of the whole sample are "confirmed" bronchitics. Of the presumptive non-bronchitics, a minority s per cent. prove to have the disease, meaning that s per cent. of $(100-p)$ per cent. in the whole sample are "unsuspected" bronchitics. Addition of these "unsuspected" bronchitics to the "confirmed" bronchitics gives the total incidence.

In practice, this calculation has to be carried out separately for each age-sex group, as the various proportions differ from group to group. Also, the whole of the $(100-p)$ per cent. of controls are not examined, but a random sample in each age-sex group, to match the presumptive bronchitics. Finally, a small number of refusals of examinations occurred in each group. In the absence of further evidence, we have assumed that these few refusals were similar to those examined in all relevant respects.

The data and method of estimation are given fully in Appendix D.

The majority of the bronchitics in each age group are found to be "unsuspected" bronchitics. Although less than a quarter of the people who told the Health Visitors that they had no cough and sputum lasting for 2 years were shown to have it by the doctors' examination, there were so many of these presumptive non-bronchitics that their contribution to the total was three times as great as that of the confirmed bronchitics

This method gives estimates of the percentage total bronchitics in each age group, which when pooled (weighted by the relative numbers in the groups) gives an over-all prevalence of 36 per cent in the whole male population aged 30 and over and 17 per cent. in the female.

In the course of this estimation, which gives a prevalence figure for men of 36 per cent, with a standard error of approximately ±2 per cent, estimates of the age-prevalence have been obtained, but these are relatively unreliable, having standard errors of the order of ±6 per cent. For example, the estimate for men aged 30-39 is 29 per cent., with a standard error of ±6 per cent, giving confidence limits of 17 per cent. to 42 per cent. bronchitics.

The reason for this very wide range of possible values for the age prevalence figures is that the percentage of "unsuspected bronchitics" is based on the small number of presumptive non-bronchitics examined Forty-two were examined in the 30-39 year group, to provide matched controls for the presumptive bronchitics found in the group. As the unsuspected bronchitics form a majority of all bronchitics in the age group, this "unreliability based on small numbers" is transmitted to the total prevalence for that decade

Sex	*Age*					
	30-39	40-49	50-59	60-69	70 and over	*All ages over 30*
	%	%	%	%	%	%
Male Method 1	29	39	41	34	43	36
Male Method 2	31	35	40	40	38	36
Female	10	15	20	23	20	17

Fewer unsuspected bronchitics were found amongst the women, and the female age-prevalence figures are thus relatively

more accurate, having standard errors of the order of ± 3 per cent., while the all ages figure has standard error about $\pm 1\frac{1}{2}$ per cent. The estimates for age-prevalence thus obtained are given in the table on page 43.

To emphasise the unreliability of the age prevalence figures, an alternative, but equally valid method of analysis is given in Appendix D, which gives quite a different pattern for the males. As has been stated, however, the all ages figures are reliable.

Higgins *et al.* (1956) found a prevalence of 28·6 per cent. in a sample of men aged 55-64 in Leigh, Lancashire, using a definition which demanded both recent chest illness and wheezing with tightness of the chest. Unfortunately a comparable figure for that age group cannot be given from the present series, though it would certainly have been a higher one.

The prevalence of 4·7 per cent. found by Fry (1955) in his practice at Beckenham, Kent, amongst 2,698 of his patients aged 30 and over does cover a cross-section of the community, but cannot, of course, be regarded as a true random sample of the population of Beckenham; and Beckenham cannot be compared with Newcastle, except by contrast Furthermore, it is questionable if all bronchitics attend their doctor. A number were encountered in the Newcastle investigation who attended no doctor.

Clifton (1955) conducted a study of symptoms of chronic bronchitis in a Sheffield factory. This gave a cross-section of the working community, though one has to recognise that those unable to work, or unable to do heavy or active work, would be excluded. This would probably mean that severe bronchitics would not be seen They proceeded by questioning, with no repeat interview, and found a prevalence of cough and sputum, with or without breathlessness, of 17·1 per cent. for men aged 30 or over, and 5 0 per cent for women of the same age group Their figures for men for the decades from 30 and upwards are, however, very close to the initial ascertainment in the Newcastle series Of the 4 observers concerned, two were medically qualified and two were Health Visitors. (See Appendix Table D3).

The numbers for women in the Sheffield experiment are rather small for the decades in question, and the comparison

is less satisfactory, for the reason that selection of the women might lead to a greater bias against the inclusion of the bronchitic person than in the case of the men.

The special interest of their study in the present connection is that the symptom-complex E+G of the Sheffield workers fits closely with the "Newcastle" definition, except, of course, for the "duration rule" and the exclusion of other diseases.

It should be pointed out that in no previous field survey of Chronic Bronchitis, or of the symptoms of chronic bronchitis, has the intial ascertainment been subject to a check by the complete review and examination, with x-ray, in all cases. Our experience suggests that the "unsuspected" bronchitics may well upset figures and conclusions based upon the one-stage ascertainment

At this stage, it is reasonable to wonder who are these "unreliable" witnesses, and their counterparts, the unconfirmed presumptive bronchitics.

The following brief analysis shows that they are in a sense borderline cases For this analysis, some of the definitions given in subsequent chapters must be anticipated.

A. Comparison of "Unsuspected Bronchitics" with "Confirmed Bronchitics".

There was a significant sex association. only 11 per cent of total women bronchitics were unsuspected, whereas 23 per cent of the men were. Within the sexes, however, there was no significant association with age. It is not the case that only the young early bronchitic at first denies symptoms, but admits to them on further questioning

Respiratory episodes were more often "infrequent" amongst the "unsuspected" male bronchitics, fewer of them had yellow sputum, and fewer of them were breathless Also relatively many more of them had the smokers' cough syndrome described on page 42, although there was no evidence that more of them smoked

These findings suggest that the "unsuspected" bronchitic does not have the disease as fully developed as does the confirmed bronchitic This is one of the reasons why he has been omitted from the main comparison of Chapters VIII-XI.

B. Comparison of "Confirmed Controls" with "Suspected Bronchitics (not confirmed)".

Turning now to the other aspect of the diagnostic problem, we find no sex or age difference between those who admitted symptoms to the Health Visitors, which were not confirmed on examination, and the confirmed controls.

There were very significant differences as far as respiratory episodes were concerned. Many more of the suspected bronchitics had frequent acute episodes and early episodes. More of them reported cough, or sputum, or breathlessness. Allergic manifestations were also more common than in the confirmed controls. The men had suffered more unemployment, and complained more of unsatisfactory temperature conditions at work

This suggests that the suspected bronchitics, not having bronchitis on examination, were rather more like the bronchitics than were the controls. Although they were diagnosed by the doctors as non-bronchitics, their inclusion amongst the controls would have diluted the controls and destroyed the comparison of the main analysis.

CHAPTER VIII

CLINICAL INDICATIONS

A SUMMARY OF FINDINGS IN 464 BRONCHITICS AND 485 NON-BRONCHITICS

THE comparisons between chronic bronchitics and controls in this and succeeding chapters will be limited to consideration of the 464 people who admitted cough and sputum to the Health Visitor, and in whom the diagnosis of chronic bronchitis was subsequently confirmed on examination, and of the 485 controls whose presumptive diagnosis of "no bronchitis" was similarly confirmed

The original plan of each bronchitic being matched by a control of the same sex and decennial age group did not succeed completely, owing to the changes in diagnosis on examination, and in a few cases to refusal to co-operate. Nevertheless the differences in the age structures within the sexes are negligible.

TABLE IV

Age in years	*Males*		*Females*	
	Bronchitics	*Controls*	*Bronchitics*	*Controls*
30-39	31	32	21	43
40-49	61	55	55	64
50-59	90	69	54	68
60-69	64	61	29	37
70 and over	26	22	33	34
Totals	272	239	192	246
Average age	55 0	54 4	55 2	53 3

There are more male bronchitics than controls, but more female controls than bronchitics. Presumptive controls subsequently found to have bronchitis were more numerous amongst the men *than amongst the women. On the other hand, more female* presumptive bronchitics were found to be non-bronchitic.

In this section of the report, some account of the results of the clinical and radiological examinations will be given. It should, however, be clearly understood that the object of these examinations, and the recording of the results, was to establish the diagnosis, and to study certain possible aetiological factors. No attempt to set out a clinical pattern for the disease was envisaged. This has, in fact, already been done by Oswald *et al.* in a series of 1,000 fully developed cases of chronic bronchitis.

Only such details as were considered to be of value for diagnostic and aetiological purposes were included in the records, therefore. It is hoped that this analysis will make clear the diagnostic procedure followed throughout the survey, in addition to the aetiological indications which it may provide.

It is also possible that it may facilitate comparison with other similar series using somewhat different criteria of recognition, although these different diagnostic standards must always be taken into account in all comparisons which are made in this chapter.

Frequent acute respiratory episodes (Appendix E1) were reported by 71 per cent of bronchitics, while only 13 per cent. of controls had them. By the term "acute respiratory episodes" is meant any acute chest illness sufficient to confine the patient to bed for a period of days or weeks. It may be the ordinary "chest cold" or an attack of broncho-pneumonia. But in order to qualify for inclusion these episodes, in a given case, must occur at least annually or more frequently. The figures cannot thus be compared with those illustrating simply the occurrence of chest illnesses in a general way. The same applies to the "early acute respiratory episode". The only difference is that by this is meant frequently recurrent chest illnesses occurring during childhood or adolescence, or both. Frequent recurrence is the essential feature. The solitary attack of pneumonia or pleurisy has not been recorded, although it is recognised that patients often date their symptoms from such an attack. It is considered that to be convincing from an aetiological standpoint a clear association of repeated respiratory illnesses (of all grades of severity) is necessary.

It is, moreover, a common experience in clinical practice to find that the relationship of a single illness to the onset of symptoms in chronic bronchitis is less close on strict enquiry than at first appears. The "pneumonia" has often occurred a

year or two before the onset of symptoms or even a few months after. This is not to say that the "pneumonia" is unrelated to the disease in such a case, but only that the relationship is somewhat uncertain

"Early acute respiratory episodes" (Appendix E2) were also significantly associated with the disease, although less strikingly so. There was also an interesting difference between the sexes. Sixteen per cent. of male and 27 per cent. of female bronchitics recalled these early attacks, while the incidences amongst the controls were only 6 per cent and 8 per cent This may be compared with the figures of Oswald *et al.* (Total 26·3 per cent. over-all). They did not differentiate between men and women, and the two series cannot, therefore, be compared directly. But as they stand, they present a roughly similar picture

The figures emphasise the dominant role of infection in chronic bronchitis, and point to the strong probability that lower respiratory infections in early life play a definite part in the initiation of the disease, even if they do not indicate just how important that part is.

Amongst the bronchitics, 87 per cent. of the men and 73 per cent. of the women stated that their cough was persistent throughout the year, the remainder owning to a seasonal (*i e* winter) cough only (Amongst the controls, 28 per cent of men and only 5 per cent of women complained of cough) (Appendix E 3)

Sputum was also usually persistent, only 15 per cent of men and 33 per cent. of women bronchitics giving a history of seasonal sputum (Appendix E.4). The sputum was described as clear or mucoid by 58 per cent of bronchitics, and as yellow by the remainder (apart from one man who insisted he had a lot of sputum but always swallowed it, and one woman who denied sputum but was not believed by the doctor it was later determined that she had told the Health Visitor she had sputum). This is a higher figure for yellow sputum than was obtained by Oswald *et al.* (42 per cent as against 30 per cent) though the observation of May on eosinophilia in the sputum as a cause of a yellow colour must be taken into account.

A symptom required by some authorities for the diagnosis of chronic bronchitis is breathlessness. 180 of our 272 male bronchitics complained of constant breathlessness, and a further

24 had intermittent breathlessness, a total of 75 per cent. breathless.

89 per cent. of the women were breathless, all but 19 of 171 breathless women being constantly breathless.

Constant breathlessness was a common symptom amongst the controls, affecting 82 out of 246, or one-third of female controls and 58 out of 239 (24 per cent.) of males. This observation is discussed in some detail later in this report.

A clinical complex which came to be known as the "Smokers' Cough Syndrome", emerged during the course of the examinations. 60 cases of this syndrome were recognised as chronic bronchitis but as 30 of them were initially ascertained as controls, they have necessarily been excluded from further consideration. *These individuals cough violently every morning for one or* perhaps for two or three hours but do not cough at all for the remainder of the 24 hours. Those with persistent sputum have, of course, been diagnosed as chronic bronchitis, though not all with this violent "morning only" cough have sputum. *All of* these persons, with only one exception (a woman who used to smoke but had given it up), were regular smokers, hence the name used to designate this group.

A personal history of allergic manifestations (asthma, rhinitis, eczema, or nettle rash) was significantly associated with the disease in each sex 31 per cent. and 39 per cent of the male and female bronchitics respectively had a history of allergy, as compared with 15 per cent. for each sex of the controls ($P < 0.001$ in each). (Appendix E7.)

A family history of bronchitis was also associated with the disease, statistically. 16 per cent. of men and 24 per cent. of women reported chronic bronchitis amongst their parents, brothers and sisters; the corresponding figures for the controls being half as many, 8 per cent. and 12 per cent. respectively. It is clear that these figures would not yield a prevalence of bronchitis in the previous generation as large as we have found in our older age groups. (Appendix E8.)

The figure may well be an under-estimate, memories often being far from perfect, or it may be that bronchitis is becoming more prevalent. But it may well indicate that family infection or pre-disposition, or both, though a factor of real importance does not operate in more than a proportion of cases.

One very striking feature of all the histories, and especia of the family histories, should be considered here. Not on was a family history of bronchitis one-and-a-half times a common amongst the women, both bronchitics and controls, but allergic family histories (although not yielding any significant association with the disease) were nevertheless twice as frequently reported by women as by men (See Appendix E8 and 9.)

It seems very probable that women are more reliable than men when it comes to the family diseases, and this is in accord with general clinical experience. If this were accepted, for example, it would make the general incidence of family bronchitis at least 24 per cent.

62 per cent. of bronchitics stated that the disease was stationary, neither worsening nor improving with the years. 19 per cent. considered that they were getting worse, and 13 per cent. had suffered recent acute deterioration. Only 6 per cent. thought they were improving, and this was invariably stated to be due to stopping or reducing the consumption of tobacco. (See Appendix E10.) It seems likely that only about a third of the cases progress beyond the stage of cough, sputum and mild breathlessness.

The Physical Examination.

It is generally agreed that there is no single physical sign, nor any group of such signs, which can be recognised as pathognomonic of chronic bronchitis. Were this not so, clinical recognition would be simpler and less controversial.

Such signs as are present are somewhat inconstant, tending to appear during exacerbations, and to disappear again. From what has been said regarding the structural condition of the lungs in chronic bronchitis, this will be readily understood. All that can be expected are recurrent but transient rhonchi and moist sounds, scattered but more often observed over the bases of the lungs; unless, of course, the presence of broncho-spasm produces its obvious and characteristic expiratory (and sometimes also inspiratory) stridor.

All cases showing this gross and obvious sign, which is characteristically generalised, have been diagnosed as chronic bronchitis with asthma, provided the clinical criteria have been satisfied.

Apart from the above findings, the signs found were those thought to be related to emphysema.

The value of the physical examination of the chest was in the recognition and diagnosis of other respiratory disease. In this the x-ray was, of course, often decisive, as will be described. But in a number of instances, clinical evidence alone had to be relied upon. This applied mainly in the case of bronchiectasis and asthma.

The Radiological Examination.

The purpose of this was to exclude or confirm the presence of other respiratory disease in persons presumed to have bronchitis, but it was considered wise to X-ray all presumptive controls who would consent to this, as some of these might well be diagnosed as bronchitic. This, in fact, occurred, as has been described.

Only 9 men and 12 women finally assessed as bronchitic were not X-rayed. 14 of these were too ill or too old, but in 7 refusals were almost entirely due to a fear of the result, which could not be overcome. Of the 443 confirmed bronchitics who were X-rayed, evidence of other respiratory disease was discovered in 9. In 5 of these changes indicative of bronchiectasis were noted, and in 3 active tuberculosis was found. The remaining case proved to be one of bronchogenic carcinoma, *i.e.* 1 in 1,071 cases. Brett *et al.* (1956) found 115 carcinomas in 87,000 cases on Mass X-ray, (rather more than 1 in 700). Wollaston (1956) found 6 carcinomas of the bronchus in 10,231 persons aged 30 and over.

In 6 of these 9, the disease in question was suspected or known prior to the X-ray, but in the case of cancer, and of one of the cases of tuberculosis, no such suspicion had been aroused. In the case of bronchiectasis, some doubt existed and the X-ray was the deciding factor.

As it happened, therefore, only 3 cases of other respiratory disease would have been overlooked, without the X-ray, and they would not have seriously affected the survey, as all were finally assessed as "chronic bronchitis with other things", on purely clinical grounds.

Of 633 persons finally diagnosed as non-bronchitic, 503 were X-rayed. This rather low figure is due to the fact that once

the diagnosis of "no bronchitis" was made, it was considered to be neither necessary nor advisable to press the individual further. It will be appreciated, however, that the total of 633 included all those presumptive bronchitics who were found to be suffering from other respiratory disease

Of the 503 actually X-rayed, 27 yielded evidence of significant abnormality. This was bronchiectasis in 11 cases, and tuberculosis in the remainder.

There were many minor abnormalities amongst the other X-ray films of both bronchitics and controls which have not been mentioned because they were not considered to be of sufficient significance for our purpose They included those appearances referred to by Simon and Galbraith in their radiological review of chronic bronchitis, such as pleural abnormalities, minor deformities of the diaphragmatic shadow, and linear opacities.

Healed primary foci, apical scarring, old healed tuberculous lesions, and in one case patchy calcification of the pleura, were encountered from time to time. In addition, in a small number of cases, vague but suspicious shadows were seen, the significance of which seemed uncertain. Not all of these persons could be persuaded to undergo investigation, but in those who did the lungs were shown to be normal in every case

With few exceptions, radiological examination was carried out in the X-ray department at the Royal Victoria Infirmary. Some preferred to attend the local mass X-ray unit, however. In the majority of cases large films were made, though many of the cases were X-rayed on the Odelca machine All the films were read personally by Dr Whately Davidson, the Physician in charge of the Department

ANALYSIS OF DIAGNOSES

The table gives the total results of all the medical examinations The diagnoses refer to the examiners' joint decision as to the cause of the symptoms in the particular case

It will be observed that the figures do not tally with those just given for abnormal radiological appearances. This is due

to the fact that on many occasions bronchiectasis was diagnosed clinically in the absence of significant abnormality in the X-ray.

TABLE V

Diagnosis	*M.*	*F*	*Totals*
Chronic Bronchitis	240	164	404
Chronic Bronchitis with asthma	20	23	43
Chronic Bronchitis with other things	12	5	17
Totals	272	192	464
Controls	231	239	470
Controls with asthma	0	5	5
Controls with other things	8	2	10
Totals	239	246	485
Presumptive Bronchitis—No Bronchitis	31	52	83
Presumptive Bronchitis—Asthma	7	12	19
Presumptive Bronchitis—Other things	30	16	46
Tota's	68	80	148
[illegible]	79	23	102
[illegible]	2	0	2
[illegible] things	0	1	1
Totals	81	24	105
Grand Totals	660	642	1,202

Note—Total asthmatics encountered ... ... 69 cases.
Total of other respiratory diseases .. 74 cases.

CHAPTER IX

DOMESTIC CARE AND SMOKING

At the time of the visit, the Health Visitors made an estimate of Domestic Care, Grade I—Good, Grade II—Fair to poor, Grade III—Bad, and also recorded whether the person was living alone, with spouse, with other relatives, or as a lodger. In neither sex is there an association between domestic situation or domestic care and bronchitis (F1 and F2)

The smoking history of each person was taken by recording their statements of the present amount smoked, the greatest amount ever smoked regularly, and the age at which smoking began.

The present amount smoked is highly associated with bronchitis (Appendix F.3). Amongst men, the proportion of present non-smokers is much lower in bronchitics than controls (11 per cent. as against 26 per cent) ($P < <0.001$) and of the smokers there are proportionately more cigarette than pipe smokers amongst the bronchitics (206 out of 242, as against 133 out of 177, i.e. 85 per cent. as against 75 per cent.). Amongst these men, however, there is no significant association between the number of cigarettes smoked at present and the disease, the fact of smoking cigarettes at all being the relevant factor.

A similar pattern emerges for the women there are more non-smokers among the controls than among the bronchitics, 72 per cent. against 40 per cent Amongst the cigarette smokers, there is in this case a relationship between the amount smoked and bronchitis, 72 per cent of the 97 bronchitic smokers smoking more than 5 per day against only 45 per cent of the 69 controls ($P < 0.05$). None of the women admitted pipe smoking as their main tobacco addiction

As people with cough sometimes give up or reduce smoking, a fairer picture of the relationship between bronchitis and smoking may be given by answers to the next question asked of the sample: "What is the greatest amount you have ever

smoked regularly?". As in the previous question, the main addiction was recorded by those who smoked both cigarettes and pipe.

The results are similar to those for
Although there are fewer non-smok
in reply to this question, a prepo
found amongst the controls. 12 p
never smoked, but only 4 per cent. o
1 d.f., P < 0·01). Again, when th
appears that fewer pipe smokers
bronchitic, 13 per cent. of the b
against 22 per cent. of the contr
there is no special association betw
smoked and the disease.

There are many more women th
have never smoked. 45 per cent
never to have smoked as much as o
and as many as 65 per cent. of the
a highly significant association betw
(P < 0·001) Once again in the
bronchitis is observed with increa
(F4.)

Another way of looking at the sm
is to analyse the age at which smok
is there a significant difference in this
and controls. (F5.)

There is no obvious explanation of
of the results with those of other work
1956). It cannot be attributed to diff
tainment If the "presumptive bronch
controls", as ascertained by the Health
compared the same conclusion is reached

whether it was primarily industrial, residential, agricultural or mining.

For those who had spent over half their life in one house there was no significant difference in any of these aspects between the houses of the bronchitics and controls of either sex. This may be in part attributable to the small numbers—rather less than a third of the whole sample had this simple type of residential history.

When we analyse the housing history of those whose frequent moving necessitated our construction of a composite house (which was "constructed" without reference to the diagnoses, of course) some differences appear.

With reference to "overcrowding", it must be explained that the demonstration of overcrowding over a long period of years is a complicated affair. It became obvious during the course of the survey that the number of persons in any one household was liable to fluctuate considerably from time to time. This meant that it was necessary to calculate the average number of persons over the whole period.

Amongst the men, there are more bronchitics than controls who had lived their lives in households occupying one, two or three rooms, a trend which is apparent (but not significantly so) in the "selected house" male inhabitants. The same trend does not, however, appear in women. In neither sex is there a significant difference in the numbers of persons in the households. The question of overcrowding amongst the men only deserves further investigation.

To do this, the density of occupation for households of 1, 2, 3, etc. persons was analysed separately, amongst the bronchitics and controls living in "composite" houses. The results are shown in Appendix G.4.

There were more persons per room in the bronchitics than the controls (1·20 as against 1·09 for all sizes of household), and examination of the table shows this to be true for each size of household separately. The consistency of this result shows it [illegible]. No such association occurs in the

[illegible] cases of overcrowding (more than 2 [illegible] they are proportionately [illegible]. The association

of bronchitis with density of occupation can be ascribed to some of the *controls* having many rooms in proportion to their household size. This is no more than the association with Social Class which will be demonstrated in the chapter "Bronchitis and Occupational History". No association of the disease with overcrowding has thus been shown, but it may be that averaging the number of persons in households over long periods does not give a true picture of the density of occupation in these households. A study of overcrowding at certain periods of life might give different results.

The work of Stuart-Harris and his colleagues on the rate of infection in chronic bronchitis and on cross-infection in the household of the bronchitic person, suggested to us the possibility of the existence of "bronchitic households". In the present survey no evidence of this has been found (as far as the population aged 30 and over is concerned).

Households where two or three cases occurred together were no more frequent than would happen by chance.

The distribution of cases by households was as follows:

1,646 households contained no presumptive bronchitics
484 households contained one each.
63 households contained two each
2 households contained three each

2,194 households contained 616 presumptive bronchitics in all

If the difference in household size be ignored, the expected number of households containing 0, 1, 2, 3 presumptive bronchitics (average 616/2194, or 0·281 per household) are 1656, 467, 65, and 4 respectively, in the absence of a tendency for bronchitics to be clustered in households. The observed distribution is so close to the expected, that we have no reason to suppose that "bronchitic households" occur.

Dampness.

Complaints of dampness in the house were recorded by both bronchitics and controls, with a significant association of dampness with the disease in both sexes, amongst the "composite house" inhabitants ($P < 0{\cdot}001$ for males, $P < 0{\cdot}01$ females. In this case the proportions complaining were the same for each sex). The "selected house" inhabitants, on the other hand,

had no difference at all in complaint rates for bronchitics and controls, although their complaint rate was almost as high as for those bronchitics who had not dwelt in one house for most of their lives.

As there is no difference between the sexes in these complaints of dampness, we may summarise the results as follows, using the terms "static" and "moving" to describe the "selected house" and "composite house" inhabitants respectively:—

Moving Controls	:	10 per cent. complain of damp
Moving Bronchitics	.	24 per cent complain of damp.
Static Controls	:	21 per cent complain of damp.
Static Bronchitics	·	21 per cent. complain of damp

The "static" population is likely to have lived in older houses, of which a high proportion were built before the end of the last century. The housing history of dampness of the "moving" population, however, has depended more upon the patient's opinion, and less upon the Health Visitor's inspection. Thus *it is reasonable to suppose that bronchitis is not associated with* damp housing, but that where an independent view was not possible, bronchitics tend to blame their condition upon the dampness of their house

The above analysis is based solely upon dampness, as a single state of housing. When the dampness is divided into grades (see Appendix G), the small numbers of grossly damp (Grade II) housing histories conform to the pattern· no difference in the "static" populations, but more very damp houses recorded amongst the "moving" bronchitics.

Locality.

In the classification of housing locality, we drew upon the experience of the Health Visitors who knew the region throughout the year, and were unlikely to be influenced by the weather conditions at the time of filling in the questionnaire. (85 per cent. of the census population was born in Northumberland and Durham, mostly on Tyneside, and most of the cases had lived on Tyneside for the greater part of their lives.)

The first classification was an opinion of the atmospheric condition of the neighbourhood. The terms clear, sooty, damp, and sooty damp and fog, were used to describe the locality. The results show no difference as between the sexes either in

the "static" or "moving" populations Adding all groups together, we find a significant difference: 69 per cent of bronchitics and 60 per cent. of controls living in sooty, damp or foggy localities, the remainder living in "clear" areas. The word "clear" has been placed in inverted commas in order to emphasise that it is a relative term There is no really clear atmosphere within the boundaries of the City.

The second way of classifying the housing environment was into "enclosed" and "open" (or "exposed"). By "enclosed" is meant a locality in which the dwellings are closely surrounded, or "hemmed in", by other buildings, whether domestic or industrial Amongst the "moving" population, 25 per cent. had not lived consistently in any one of these types of locality, but the remainder show significantly more bronchitics living in enclosed areas

In this respect again, there is no difference between the sexes, or between the "static" or the "moving" population, if the "inconsistent" cases are excluded When all groups are combined, the following result is obtained:

TABLE VI

Locality	*Bronchitics*	*Controls*	*Totals*
Enclosed	249 (67%)	220 (54%)	469
Open	121 (33%)	190 (46%)	311
Totals	370 (100%)	410 (100%)	780

This table shows a significant association between the enclosed localities and the disease Even within the sooty, damp, and foggy areas there is still a significant association between "enclosed" localities and bronchitis.

The preceding analysis has referred to the housing conditions of the person's lifetime, which is considered to be more relevant than the conditions at the time of the survey. At the conclusion of this section, however, it is interesting to relate his residence at the time of the survey to his chance of having bronchitis.

As was found in the calculation of prevalence in the sexes, it is not possible to obtain accurate prevalence figures for areas as small as the wards of the city, but for larger areas, the figures are more reliable. In Table VII the prevalence figures for the

three areas of Newcastle defined in Chapter IV are given, along with the density of population figures in persons per acre.

TABLE VII

Prevalence by habitation at time of survey

Area	*Estimated prevalence of bronchitis (%)*	*Density of population*
Western	31	51
Eastern	29	39
Northern	23	22
Totals	27	32

Data for these prevalence figures are given in Appendix Table G.9.

The higher prevalence in the more densely occupied industrial riverside areas (Eastern and Western) lends weight to the association of the disease with atmospheric pollution and enclosed areas.

CHAPTER XI

BRONCHITIS AND OCCUPATIONAL HISTORY

Males.

As bronchitis is a long standing disease, it is necessary to record the complete occupational history of each patient and control. As in the housing section, jobs which had lasted for less than two years were excluded, and up to four other jobs were recorded, working backwards from the time of interview. 80 per cent of the sample had spent one half or more of their working life (*i.e* from age 14) in one occupation This group, who are referred to as "one job only" men, includes those who have followed the natural upgrading within their occupation (*e g.* shop assistant to store manager, ship's plater to foreman plater in the shipyard), who are classified according to their present status, and those who have kept the same occupation under several employers. Where conditions of work have changed, this has been taken into account. (It should be noted that 77 per cent. of the "one job only" men had, in fact, spent over two-thirds of their working life at the same job) The remaining 20 per cent. of men had not spent as much as half their life at one occupation, and these are referred to as "occupational wanderers" for the purpose of this survey.

It is necessary to separate them to see whether the method of averaging their working conditions (rather similar to the construction of a "typical" house) produces different results from those where occupation has been more consistent. Although there were rather more "wanderers" amongst the bronchitics, this is not a significant association

The information collected consisted first of the title of the occupation itself, which could be classified according to the Registrar-General's Occupational Order and Social Classes, and then the subject's description of and complaints about working conditions. These were included since the working

conditions of two men in the same occupation may differ very widely.

The chief occupations followed in the bronchitics and controls for at least half the working life were as follows:—

TABLE VIII

Registrar General's "Orders"	*Male Bronchitics*		*Male Controls*	
	No	%	No	%
[illegible]	12	4	8	3
[illegible]	60	22	44	18
[illegible]	7	3	7	3
[illegible]	21	8	11	5
[illegible]	3	1	10	4
[illegible]	24	9	25	10
[illegible]	17	6	19	8
[illegible]	8	3	16	6
[illegible]	5	2	16	6
[illegible]	8	3	11	5
Wanderers	62	23	40	17
All Others	45*	17	32*	13
	272	100	239	100

* No Order included here contains more than 8 men in either group

The occupational constitution of the controls shows that the sample has given an accurate reflection of the population of the City. (See Appendix Table H.8)

Three occupational groups stand out as being favourable from the point of view of bronchitis. These are XVI—Administration, XIX—Professional, XXIII—Clerks, Typists, (all of which have significantly higher numbers in the controls), or the "White Collar" occupations. It is impossible to say that the disease is significantly associated with any one of the other occupations. It will be noted that only 3 per cent. of the population of the City are engaged in mining or quarrying. There are slightly more bronchitics proportionately in Building and Contracting, but this, as with the "wanderers", does not reach significance.

There is a definite association of the disease with Social Class (Registrar General's Classification, 1950), amongst the men.

TABLE IX

Social Class	*Male Bronchitics*		*Male Controls*	
	No	%	No	%
1. Professional	4	1	14	6
2 Intermediate	16	6	29	12
3 Skilled	170	63	140	59
4 Semi-skilled	41	15	33	14
5 Unskilled	41	15	22	9
Totals	272	100	238*	100

* One of the "wanderers" had not spent as much as half of his working life in jobs of any one social class

The Social Class association is noticeable as a relative deficit of Class I and II amongst the bronchitics, and an excess of Class V.

The Social Class distribution of the controls is relatively short of Social Class V, when compared with the 1951 Census data for the City. This may be due to a change in the true situation between 1951 and 1955 or it may reflect a slight upgrading of occupation by some of the sample. (See Appendix H 9) (See Appendix H.10 for comparison with mortality data.)

In the North East, the slumps caused considerable unemployment. The collection of occupational history for males would be incomplete without a record of unemployment, which, as is shown, is associated with the disease, suggesting a relation to economic conditions.

TABLE X

Unemployment	*Male Bronchitics*		*Male Controls*	
	No	%	No	%
None or under 2 years	181	67	200	84
2-5 years	47	17	19	8
6-10 years	32	12	12	5
11 years and over	12	4	8	3
Totals	272	100	239	100

Within Social Class III, this association is still significant. (See Appendix H.11.)

The interpretation of the sample population's reports of working conditions must take into account the possibility that a man with no disease may not consider conditions to be unsatisfactory, of which a bronchitic person may bitterly complain. For example, a man with a cough will be more likely to notice and complain of dustiness which to a healthy man is not a striking feature. It is, nevertheless, interesting to note that when the men were asked the general question "are your working conditions satisfactory from the point of view of health?" there was no difference between the replies of the bronchitics and controls. (Appendix Table H.3.)

When asked their opinion as to the cause of their complaint, only 44 of the 272 male bronchitics had no suggestion to offer. 111 (41 per cent.) mentioned working conditions as a contributory cause, 80 (29 per cent.) mentioned smoking, and 40 (15 per cent.) a previous chest illness

When the 71 men who regarded their condition as steadily progressive, or who had suffered a recent deterioration, were asked for their view as to the cause of this deterioration, 17 mentioned working conditions, and 11 a chest illness. 43 had no suggestion to make

Jobs were classified according to the amount of physical effort involved, into the classes "Heavy", "Active", "Light", or "Sedentary"; for definition see Appendix B. Amongst the "one job only" men there was a tendency towards the heavier jobs being associated with bronchitis, as shown in the following table:

TABLE XI

Occupation	*Male Bronchitics*		*Male Controls*	
	No	%	No.	%
Heavy	90	43	63	32
Active	94	45	92	46
Light	13	6	21	10
Sedentary	13	6	23	12
Totals	210	100	199	100

(The "occupational wanderers" are excluded from the above table.) The apparent association of heavy work with the disease does not exist when social class has been taken into account.

The next point for consideration is whether the work is indoor, outdoor or underground. Here it is necessary to divide the "one job only" men into two groups. Amongst the men who had stayed for two-thirds of their life at one job, the proportions in the bronchitics and controls were almost exactly equal, about two-fifths being predominantly outdoor workers, 4 per cent. underground workers, and the remainder working indoors. Of the men who had spent half, but not as much as two-thirds of their time at one occupation, there were significantly more outdoor and underground workers amongst the bronchitics. It might be that bronchitis had caused these men to change an outdoor job, held for more than half the life, to an indoor job. (See Appendix H.)

Of those who had spent at least half of their working life at one job, there were more reports of draughts at work amongst the bronchitics, and this is a significant finding.

TABLE XII

Draughts at Work

Condition	*Male Bronchitics*		*Male Controls*		*Totals*
	No	%	No	%	
Draughts	75	36	49	25	124
No draughts	135	64	150	75	285
Totals	210	100	199	100	409

With regard to unsatisfactory conditions of temperature, it should be explained that the term "extremes of temperature" is intended to convey sudden and considerable variation in temperature experienced daily at work.

TABLE XIII

Temperature at Work

Condition		Male Bronchitics			Male Controls			Totals
		No.		%	No.		%	
Temperature satisfactory ...			167	80		174	87	341
Temperature unsatisfactory	Too hot	7	43	20	3	25	13	68
	Too cold	7			8			
	Inconsistent	3			0			
	"Extremes"	26			14			
Totals ..			210	100		199	100	409

Unsatisfactory temperature at work is clearly associated with bronchitis. The particular condition is obviously "extremes of temperature", which will be considered further.

Dust at work was also more common amongst the bronchitics than it was amongst the controls, again excluding the "wanderers": the following table gives the details.

TABLE XIV

Dust at Work

Condition	Male Bronchitics		Male Controls	
	No	%	No.	%
Very dusty	87	41	55	28
Not very dusty	123	59	144	72
Totals	210	100	199	100

Rather more of the bronchitics (25 per cent.) than the controls (18 per cent.) complained of fumes at work. This does not [illegible] Similarly, [illegible] dampness at [illegible] and controls mentioning this amongst adverse working conditions.

The above analysis has referred only to those men who have remained in one occupation for at least half of their working

life, distinguishing those who had been at one job for more than two-thirds of their life, when they differ from the others. So far, the "occupational wanderers", whose working conditions have been constructed from their reports of their various occupations, have been left out of account. There are 62 bronchitic and 40 control men in this category, and the only recorded aspect of working conditions in which they differ significantly is in temperature conditions. 17 of the bronchitics and only 3 of the controls had unsatisfactory temperature conditions, the majority of the complaints again being of extremes of temperature. Amongst these 17 "occupational wanderers", 11 reported "extremes of temperature", which was also the condition mentioned by the 3 controls Considering "extremes of temperature" as an occupational hazard in connection with chronic bronchitis and combining these figures with those for the "one job only" men, the following result is obtained.

TABLE XV

Condition	*Male Bronchitics*		*Male Controls*		*Totals*
	No	%	No	%	
Extremes of temperature	37	14	17	7	54
Others	235	86	222	93	457
Totals	272	100	239	100	511

The absence of a significant association with draughts and dust in this smaller group of "wanderers" does not invalidate the conclusions in the main group. There is a slight tendency in the same direction in each case, but it was felt preferable to base findings on the larger group with its more consistent histories

Females.

The great majority of the sample were housewives, which does not appear as a gainful occupation in the Registrar General's list. It was decided to classify all housewives dependent upon their husbands by the social class of his occupation (For the purpose of this survey no differentiation is made between legal spouse and cohabitant.)

Amongst the women, the chief occupations are as follows:

TABLE XVI

Registrar General's Orders	*Female Bronchitics*		*Female Controls*	
	No.	%	No.	%
XVIII Commercial Occupations	6	3	9	4
XXII. Personal Service, Hotels ...	9	5	19	8
XXIII. Clerks, Typists ..	1	1	19	8
Housewives ..	155	81	165	67
"Wanderers" .	11	6	15	6
All others	10	5	19	8
Totals ...	192	100	246	100

The only obviously non-bronchitic occupation is clerical and typing There is also an excess of housewives amongst the bronchitics. These "significant" differences are of no importance, as they are largely the effect of age. Whereas 17 of the 19 clerks and typists were aged under 50, less than 40 per cent. of the housewives were under 50.

When the conditions of the employment are considered, it is found that of the women who had worked half their working lives in one job, twenty-two of the 231 controls, but only one of the 181 bronchitics, had a sedentary job. These figures are closely related to those for clerical work mentioned above. "Light" work was mentioned for ten bronchitics and only one control.

Outdoor work was very uncommon, being noted for only three women in the whole survey. The same is true of all the complaints of unsatisfactory working conditions—draughts, damp, dust, fumes and unsatisfactory temperatures. They were very rarely mentioned, and the few people who did complain were evenly divided between the controls and the bronchitics. The question of unemployment was less meaningful amongst women, and no association was found.

There is then no indication that any specific occupation of itself causes bronchitis, but certain particular conditions, notably

unsatisfactory temperature conditions and draughts, which might occur in many occupations, are associated with the disease.

TABLE XVII

Social Class	*Female Bronchitics*		*Female Controls*	
	No.	%	No	%
1 Professional	5	3	7	3
2. Intermediate	11	6	26	12
3 Skilled	102	60	141	63
4 Semi-skilled	22	13	21	9
5 Unskilled	31	18	29	13
Totals	171*	100	224*	100

* 21 bronchitics and 22 controls were unclassified—husband's or late husband's job not specified

Usually, in comparing mortality or morbidity rates in occupations (e g. Registrar General's Decennial Supplements on Occupational Mortality), higher rates in men than in their wives within one group are taken as an indication of an occupational factor, while higher rates in the group without this sex difference indicate an economic influence.

In this instance the rates are similar in each case, with rather more bronchitics amongst Social Classes IV and V, indicating a slight association with economic factors, which is supported by the finding in connection with unemployment.

No effort was made to relate bronchitis to income for several reasons. The value of money is very inconstant; reliable figures over long periods would be difficult to obtain, and the attempt to do so might lead to hostility amongst the sample

CHAPTER XII

DISCUSSION

ALTHOUGH the role of infection is an essential and even a dominant one, chronic bronchitis is a social disease.

This has been taken as a statement of fact in this investigation and is, it is believed, generally accepted to-day. There is a considerable volume of evidence, very little of which has been adduced. Its collection and analysis was considered to be unnecessary as it is readily available.

Social study is in itself a difficult and treacherous field of investigation, full of traps and pitfalls for the unwary. But the social study of chronic bronchitis, if not in a class by itself, is in quite a small class.

The pathology is known, the clinical pattern is emerging, and the bacteriology is being clarified. But the disease is, nevertheless, clinically elusive and diagnosis, the essential basis of all studies of disease, is too often a matter of opinion.

Articles reporting a study of chronic bronchitis exhibit different standards of diagnosis and Fry, from his experience in general practice, finds it necessary to recognise 4 groups

Appreciating, however, that in a field survey, criteria of diagnosis must be clear, simple, and easy to recognise, it has been thought wise as stated earlier to establish such criteria. Those which have been chosen are symptoms, because no sign or group of signs which could be elicited on examination is of any diagnostic value.

This clinical definition proved valuable in practice, doubtful cases being uncommon, and presenting no really serious difficulty. As, however, it differs somewhat from those recognised by other workers, some brief discussion of it in the light of the results seems advisable.

As has been stated, it was desired to include *all* cases of chronic bronchitis, the early and the milder as well as the fully developed and the more severe. This yielded a prevalence rate

of 36 per cent. for men and 17 per cent. for women aged 30 or over Had constant breathlessness been demanded as a symptom essential for diagnosis, thus bringing the criteria more in line with Oswald's definition, and the "Triple Complex" of Stuart-Harris, the rate would have been 21 per cent. for males and 14 per cent. for females. Our reasons for omitting dyspnoea as one of our essential criteria have been stated, one of them being the difficulty of assessing its significance when observed. Dyspnoea can only be of value if it can be primarily related to the respiratory disease with some degree of certainty

The prevalence of dyspnoea amongst controls and the predominant feminine incidence in both controls and bronchitics, renders this doubtful. Extraneous disease could not account for it. There were 5 female asthmatics, but no other cases of respiratory disorder in controls Other possible causes of dyspnoea were equally divided, the only important one being valvular disease of the heart (7 cases in all). Nevertheless, 1 in 3 of all female controls, and 1 in 4 of all male controls, were short of breath; and there was a considerable difference between the sexes in this respect amongst the bronchitics. Had dyspnoea been demanded as an essential diagnostic symptom, the male prevalence figure would have been lower by 40 per cent, and the female prevalence by less than 20 per cent

This tendency to breathlessness in the later decades, particularly in women, has to be taken into account if dyspnoea is to be used as a criterion (See Appendix E, Table 6)

[illegible]

naturally in the middle and later decades, and is commoner in women than in men

It is clear that the prevalence of chronic bronchitis is twice as great amongst men as it is amongst women This ratio (M/F=2 0) is certainly less than that for mortality reported by Lane *et al* (M/F=3 5), but it is in the same direction

In the present state of knowledge one cannot with confidence compare morbidity and mortality figures—they are not compiled according to comparable standards.

The importance of infection in the progress and development of the disease is shown by the frequency of acute respiratory

episodes in the bronchitics (71 per cent.) as compared with the controls (13 per cent.). Acute respiratory episodes in early life were also significantly greater amongst bronchitics, suggesting *infection as an initiating factor as well. (cf. Stuart-Harris.)*

The highly significant relationship of a personal allergic history seems to indicate constitutional pre-disposition to chronic bronchitis, although no clear support is given by the figures for allergic family history in the two groups. It cannot, of course, be assumed that persons with no obvious allergic history, personal or hereditary, are not liable to hypersensitivity.

The definite association with bronchitis in the family cannot be taken as certainly due to heredity, as it might be due to cross-infection within the family circle, as pointed out by Stuart-Harris (1954). But the evidence of this is, so far, suggestive only, and the fact that no evidence of the existence of "bronchitic households" was found (see page 51) is perhaps rather against it as more than a partial explanation.

The idea that cross-infection within the household might be *a factor in chronic bronchitis leads to a supposition that over*crowding would be expected to be a feature of the bronchitic's family life to a greater extent than in the case of the non-bronchitic This has not been shown in the present survey, but the difficulty of assessing *accurately* the extent of over-crowding over long periods of time has been mentioned.

Other respiratory disease, with the exception of asthma, was not a common association, giving the impression that the occurrence of the two diseases in the same person was due entirely to chance (17 cases in 464).

Asthma was more frequent than would have been expected. 43 cases in 464 persons is much above the prevalence in the general population, as indicated by our control series (5 in 485).

In all discussions of the aetiology of chronic bronchitis, two aspects have to be kept equally in mind. On the one hand, those factors which initiate the disease are to be considered, and on the other the factors of aggravation, which are concerned with the further development and progression of the disease process Chronic bronchitis is, of course, not peculiar in this respect, but the point is of peculiar importance in this disorder. The clinical course and the morbid anatomical appearances strongly suggest a more or less gradual process, varying in

tempo from time to time, but capable of arrest or perhaps of healing, at least in the early years or in the mild case Even as things are, long stationary periods occur and, of the present series of cases, the disease was clinically stationary in 62 per cent.

Certain aetiological factors may be concerned both with initiation and aggravation, and others perhaps with aggravation alone. For example, there has been found, in this inquiry, an association of the disease with constitutional allergy.

If there is a constitutional pre-disposition in any individual, it will always be present, and will be liable to exert its influence throughout life. Respiratory infections in early life, on the other hand, may help to initiate the disease (and the figures of the present analysis give support to this idea) but their action is limited to this. Recurrent acute episodes in later life will, of course, act as aggravating factors The smoking of cigarettes, and occupational dusts, both of which have been shown to bear a relationship to the disease, are likely to act only at times of exposure. If the person stops smoking, or changes his job, they cease to operate, and, in the case of smoking, abandonment of the habit was associated with each and every of the 30 cases in which clinical improvement was reported It would be interesting and instructive to follow 100 reformed smokers, with bronchitis, over a period, if only one could be assured they would "stay reformed".

The pathological changes of chronic bronchitis are unusual, and any discussion of aetiology must take into account the possible pathogenesis of such changes Therefore, all considered aetiological possibilities must be factors pre-disposing to persisting inflammatory processes at the extremities of the bronchial system

Those irritants and poisons, whether mechanical, physical chemical, or infective, which hinder or disturb ciliary action and other defensive properties of the lung (such as the function of the bronchial mucous glands) must be considered, together with any inherent constitutional defect, such as has been mentioned, which could enhance the deleterious action of such irritants and poisons

Little is known of these processes in chronic bronchitis, but the effects upon the bronchial wall have been clearly demonstrated. This was discussed in the chapter on pathology and

pathogenesis. There, for example, it was mentioned that *certain viruses can damage the bronchiolar wall* so that a micro-organism, such as the Haemophilus Influenzae (which is known as a common pathogen in chronic bronchitis) can penetrate deeply, and establish itself within the wall itself.

The considerable differences in mortality from chronic bronchitis which exist between industrial and rural areas in England and Wales, have naturally directed attention to atmospheric pollution, which has been recognised as a nuisance for at least 300 years. John Evelyn, in his "Fumifugium" (1661) discussed the pollution of London at some length. He tells us that in that year King Charles II "was pleased to discourse to me about my book inveighing against the nuisance of the smoke of London, and proposing expedients how, by *removing those particulars I mentioned, it might be* reformed. commanding me to prepare a Bill against the next Session of Parliament, being, as he said, resolved to have something done in it".

Its effects are recognised to be due mainly to the chemical impurities, which are mostly in gaseous form, but smoke and solids exert an important indirect influence by reducing and hampering the action of sunlight. Not only is sunlight beneficial to health, but its action causes other pollutants to rise, thus raising them above breathing level

This is not the place to enter into a detailed discussion of atmospheric pollution, even were the present authors competent to do so It is, nevertheless, necessary to assemble a few known facts in order to make plain the place which it may have in the present subject of discussion, the aetiology of chronic bronchitis.

Sulphur dioxide is the gas which has been most studied in this connection, *and seems to be the most important one.* Its natural tendency, in damp conditions, to be transformed into su

fo

(1955) tested the method used by Amdur *et al.* by employing various checks and controls, and was unable to confirm their general results. It appeared that *these could have been due to* chance in a small series of cases. Two normal persons developed

audible signs of bronchospasm during the inhalation of 10 p.p.m., however, and they observe that susceptible individuals might well react in a characteristic manner.

Haggard (1923) considered that long-continued irritation might lead to an excessive mucus coat which could lead to greater damage from the gas by subduing normal respiratory reflexes of a protective nature.

Cralley (1942) tested its effect on the ciliary activity of rabbits, and found that this was depressed in "irritant" concentrations and Pattle noted similar effects, though he found rabbits to be less sensitive than guinea-pigs. In humans wheezing and breathlessness might persist up to 3 weeks after 30 minutes' exposure Such variations in sensitivity occurred that Pattle considers that further experimental work of this kind is unjustifiable.

Thus, it is clear that SO_2 can irritate the normal lung, causing a pronounced mucous reaction, and that continued exposure may produce a thick coat of bronchial mucus which would certainly be sufficient to hamper ciliary action Also, it seems that the cilia themselves may be directly affected by the gas

The tragic fog deaths of London (Logan, 1953, 1956) have attracted world-wide attention, and rightly so. It is evident, however, that minor but repeated insults are being offered, over the years, to the lungs of every citizen of an industrial area in the country

The evidence of this survey shows that even within the confines of a relatively constricted area, distinctions can be made by the intelligent inhabitant, which are significantly related to the prevalence of bronchitis. Closely associated also is an "enclosed" situation, which could favour persistence of pollution locally. (See chapter on housing for definition of "enclosed".)

The fact that a significant relation to prevalence can be demonstrated between "bad" and "very bad" degrees of pollution suggests that a much greater and probably striking contrast will be shown when areas of slight are compared with those of gross pollution

In this connection, it is of interest that D D Reid (1956) found quite obvious differences in rates of sickness due to

bronchitis in Post Office workers, according to locality, within the London Area.

Housing in itself has not been proved to bear any relation to the prevalence of chronic bronchitis, and it is the situation of the house rather than the house itself which is important in this connection

Of possible physical *pre-disposing agents, the most significant* in the present study seemed to be what has been called "extremes of temperature". By this was meant wide and sudden changes in temperature experienced repeatedly during the working day. It was included because of frequent complaints by patients seen

Social Class V is associated with mortality from chronic bronchitis, and the present survey shows an association with morbidity This association with Social Class V, in men, is accompanied by a similar trend amongst the women, and may be considered in conjunction with an equally or perhaps rather stronger association with unemployment for periods of over 2 years total

The suggestion is of an economic rather than of an occupational factor, and is reinforced by the fact that unemploy*ment is a significant association* within Social Class III. (Appendix H.)

The data acquired in the Newcastle Survey have been *considered and their significance and possible aetiological* bearing discussed. It will be useful now to gather all this information together and reconsider it with what evidence exists *outside the present study.*

The situation of the characteristic lesion in chronic bronchitis and the gross mucous hypertrophy must both be borne in mind, but perhaps the mucous *reaction is the more interesting for our* purpose at present. Its importance in relation to chronic infection of the type with which we are concerned has been described in some detail already. *Its originating cause,* and the reason for its long persistence have now to be elucidated, as far as possible.

An increased production of mucus is part of the natural reaction of the bronchi to infection and irritation, and in its

right and proper amount it constitutes a valuable vehicle for the evacuation of bacteria and their products, along with other foreign material. What has to be discussed here, however, is the constant production over long periods of time of excessive amounts of mucus, which hamper ciliary action, and thus contribute to the retention and extension of infection within the lung

This is not a normal response, and its characteristic presence in chronic bronchitis demands an explanation if the pathogenesis, and hence the aetiology of the disease is to be understood Unfortunately, there is as yet insufficient evidence on which to establish an explanation which would provide a satisfactory answer to all the questions which may be asked.

The "hypersensitive" explanation is naturally the first that comes to mind. The bronchial response of the asthmatic is characteristically one of excessive mucus production, and the liability of the allergic mucous membrane to retain infection is clearly seen in the case of chronic suppuration of the antrum The fact that the development of chronic continuous asthma, supervening upon the intermittent attacks of early life, is so frequently associated with emphysema, is a proof that chronic bronchitis is the complicating factor

Gough (1955) found that even the most severe and persistent case of asthma, going on to status asthmaticus and death has no emphysema, whereas the chronic bronchitic is always emphysematous

The term "asthmatic bronchitis" must mean this complicate asthmatic state, if it means anything

The high incidence of bronchitis in the families of bronchitic and the prevalence of personal allergy amongst the bronchiti themselves, are also suggestive.

And yet it is known that men and women suffer from asth in almost equal proportions, whereas chronic bronchitis is p dominantly a masculine disorder, in the ratio of 2-1 A alternative explanations offer themselves The bron infection may be due initially to a virus, and repeated infection favours permanent colonisation of the lower respir track by bacteria This might also, perhaps, by its irr effects account for the constant excess of mucus, and the m

hypertrophy, which has been referred to. Furthermore, cross-infection in the family circle may account for the family tendency shown by the disease.

Evidence *in favour of both these hypotheses has been given.*

In this investigation it has been shown that, in addition to infection, chronic bronchitics have constitutional and familial tendencies. But it has also been shown that draughts, exposure to extremes of temperature, and very dusty conditions of work, pre-dispose to bronchitis: all of which are environmental factors peculiar for the most part to males. Moreover, smoking, which has been shown to be clearly associated with the disease, is predominantly a masculine addiction. Of the 1,202 persons investigated in detail, 83 per cent. of the men, and only 41 per cent. of the women were smokers. It is therefore probable *that men, by reason of their occupational* environment and personal habits of smoking, are pre-disposed to aggravation and persistence of bronchitis to a greater extent than are women. And this is quite apart from the possibility that they are exposed in a greater degree to respiratory infection by reason of their work in factory, workshop, or mine, in contact with numbers of others.

It seems, therefore, that considerations such as the above destroy any argument based on variation in prevalence by sex between allergy and bronchitis. The frequent association of asthma with bronchitis is shown by the figures given in the *analysis (43 in less than 500 cases) Furthermore, of 50* consecutive admissions to hospital under the care of one of [illegible] characterized by cough

[illegible]

were treated with ACTH and appropri[illegible] these (78 per cent.) were very considerably and even dramatically improved That this improvement was due to the hormone rather than simply to the anti-biotic, is shown by the fact that maintenance on Cortisone or ACTH was not only successful, but necessary. Anti-biotic treatment alone is not often successful, and then only for a while. Maintenance by anti-biotics has proved an expensive failure in the majority of cases of this type seen in the North-East.

These figures have been given because it is said that a constant

wheeze, which is not asthmatical, may be associated with chronic bronchitis. However this may be, chronic bronchitis *per se* does not respond to cortisone or ACTH (though it does, to a certain extent, to anti-biotics), and one can only regard the response in the 36 cases mentioned above as proof that the wheezing in these was asthmatical.

This argument has been followed through in order to bring into prominence the special liability of the asthmatic to chronic bronchitis.

Asthma has been referred to as an example of hypersensitivity which is liable to complication by chronic bronchitis The word "allergic" was used because the allergic reaction is typically a mucous one in the respiratory tract. It is not intended to engage in any controversy regarding "allergy" and "hypersensitivity" Both words are much abused in medical literature Asthma, however, if not always "allergic" is always "hypersensitive" and the object has been to demonstrate in this way that the hypersensitive individual is peculiarly liable to chronic bronchitis. It is, moreover, a matter of common clinical experience that some persons who cannot be demonstrated to be "allergic" are "hypersensitive" to certain infections and irritants There seems to be, as it were, some personal idiosyncracy

It is now suggested that, in an uncertain but possibly considerable proportion of cases, there is a constitutional pre-disposition to the disease, and that this pre-disposition may be hereditary.

This constitutional factor, when present, acts by a violent mucous response to infection and irritation, which hinders evacuation of infective products, and so perpetuates both itself and the infective process

It is not suggested that "pre-disposition" is a factor in all cases of chronic bronchitis, or perhaps in the majority

Once established, continuing infection, and repeated trauma by exacerbation and external irritants, may prevent healing of the inflammatory process in any individual. This has been emphasised by Stuart-Harris (1954), who has likened the process to chronic wound infection. The mucous hypertrophy would thus be accounted for.

Whether or no "hypersensitivity" exists in a given case, these

for detailed investigation which was successfully completed in 1,202 This is a refusal of only 4 per cent. which is regarded as satisfactory

6. There was no variation in observation ("Observer error") between doctor and doctor, or between Health Visitor and Health Visitor. There was, however, an "Observer error" between Health Visitor and doctor amounting to 17 per cent. (See Appendix C.) It is doubted if this figure could be bettered, but its effect was to prevent the establishment of reliable figures for prevalence by age

7. Total prevalence by sex was established, however, and this came out at 36 per cent. for men aged 30 and over, and 17 per cent. for women of the same age group.

8 A personal history of allergy, and a family history of bronchitis, was more commonly met with amongst the bronchitics than amongst the controls, and asthma was 8 times as common in the bronchitic group

9 Smoking of cigarettes was much more common in bronchitics than in controls, and men were found to smoke much more commonly than women. No association was seen between the actual number of cigarettes smoked and the disease.

10 There was no relationship between the standard of personal domestic care, and bronchitis.

11. Housing in itself seemed to be unrelated to the disease

12 Locality was, however, seen to be important. Not only was bronchitis more frequent with prolonged residence in sooty damp and foggy surroundings, but an enclosed situation was closely associated with bronchitis, both generally and within sooty damp and foggy districts.

13 No particular occupation was seen to be associated with chronic bronchitis

14 The working conditions shown to be related to bronchitis were extremes of temperature, draughts and dusty atmosphere

15. A significant preponderance of bronchitics were found in Social Class V, and amongst those who had suffered from unemployment This was thought to indicate an "economic" association, rather than an occupational one.

16. There was no significant occupational factor which could be said to be concerned with the prevalence of bronchitis in the female.

external agents would help to maintain this state of affairs whether by the atmosphere, the cigarette, or the dusty job.

Prevalence by sex depends on the circumstances of life of the two sexes, and not on any inherent difference between them.

Chronic bronchitis seems to be a condition of long-continued bronchiolar inflammation maintained and aggravated by many factors, and one which could be halted, perhaps healed, by their removal: or prevented from developing if they were absent.

Even under present conditions it is probable that only about a third of cases go on to the progressive phase of obliterative bronchiolitis with its inevitable complication of emphysema; and the probability is that of these many will die of some intercurrent disorder such as coronary thrombosis, malignant disease or other cause.

Nevertheless, the problem is clearly a large one and demands attention.

SUMMARY

1. *A survey* of chronic bronchitis in Newcastle-upon-Tyne has been carried out, using a sample consisting of every 40th house, taken from the voters' lists. Recognition of the disease was governed by a set of clinical criteria erected into a definition, and all persons under the age of 30 were excluded.

2. The initial ascertainment and the social enquiry were made by the Health Visitors of the City, each working in her own district: and for every presumptive bronchitic person a comparable "control" was chosen by a random method.

3. All cases, both bronchitics and controls, were medically *examined, all the doctors concerned being ignorant of the* initial ascertainment.

4. Diagnosis was made in accordance with a clinical definition designed to include all cases of persistent bronchitis, the early and the mild as well as the fully developed and severe. This wide definition accounts for the high prevalence figure. It is considered probable that not more than a third of these pass on *into the irreversible and progressive phase, that of obliterative* bronchiolitis.

5. 3,866 persons were included in the sample, 3,840 of whom were interviewed: and 1,250 were selected as has been described,

for detailed investigation which was successfully completed in 1,202. This is a refusal of only 4 per cent. which is regarded as satisfactory.

6. There was no variation in observation ("Observer error") between doctor and doctor, or between Health Visitor and Health Visitor. There was, however, an "Observer error" between Health Visitor and doctor amounting to 17 per cent. (See Appendix C.) It is doubted if this figure could be bettered, but its effect was to prevent the establishment of reliable figures for prevalence by age.

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Even under present conditions it is probable that only about a third of cases go on to the progressive phase of obliterative bronchiolitis with its inevitable complication of emphysema, and the probability is that of these many will die of some intercurrent disorder such as coronary thrombosis, malignant disease or other cause.

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CONCLUSIONS

1. The use of Health Visitors as medico-social investigators is a satisfactory method, but ascertainment should always be checked at medical examination by experienced clinicians.

2. The value of a central office with an experienced organising secretary has been so clearly shown that it is considered that such an organisation is required for the management of any large-scale medico-social study of a similar type Thorough preparation is essential.

3. In the study of a long-continued social disease the whole or greater part of a person's life must be taken into consideration. One method of doing this has been put forward.

4. Even within an industrial city differences in locality may be sufficient to allow of a demonstration of the effects of environment upon health.

5. In a considerable proportion of cases of chronic bronchitis a constitutional pre-disposition to the disease exists, which may be hereditary.

6. There are two stages in the course of the disorder in the great majority of cases. During the first of these the condition is likely to be reversible and capable of healing, whereas the second stage is that of progressive obliterative bronchiolitis, which is irreversible. It is considered probable that about one-third of cases, under present conditions, pass on into the second and more serious phase

7. Infection is the dominating factor in chronic bronchitis, but this is maintained and aggravated by other environmental agents

8. Such environmental factors seem to be cigarette smoking, atmospheric pollution (particularly in enclosed situations) and dust, draughts and extremes of temperature at work.

9. Elimination of these factors might well lead to arrest or healing of the process during the early stage, before irreversible changes occur.

10. Further studies on these lines are necessary if a clear understanding of the aetiological factors of chronic bronchitis is to be attained.

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APPENDICES

APPENDIX A

A1. *Population in the 3 areas of the City*

Area	1913	1938	1955
West	79,800	80,690	86,250
East	126,250	126,100	97,230
North	65,240	84,520	97,520
Newcastle	271,290	291,310	281,000

APPENDIX B

METHOD USED IN EDITING RECORDED INFORMATION RELATING TO HOUSING

1. "Selected house"

If any house had been occupied for half the subject's lifetime, this was taken as a typical house

If only two houses were recorded, and each had been occupied for the same period of time, the *earlier* house was chosen. As the disease is frequently long-standing, it was felt that this method would give weight to the earlier housing, which might more nearly correspond to the age of onset of the disease (or age of failure to contract it in the case of controls).

2. "Composite house" If three or more houses were recorded, none of which covered half the subject's lifetime, a "typical" house was constructed as follows —

If half the lifetime, or more, had been spent in one *type* of house, this was ringed.

Rooms and persons An average was formed, weighted according to length of residence

e g., Three rooms—3 for 12 yrs , product 36
Four rooms —4 for 8 yrs , product 32
One room —1 for 30 yrs., product 30

50   98

Average number of rooms $\frac{98}{50}=2$ (ring 2 rooms)

The same procedure was adopted for persons.

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50 98

Average number of rooms $\frac{98}{50}$=2 (ring 2 rooms).

DAMPNESS: Average was weighted, as above. If the average was under ½, this was considered "dry". If over ½ and under 1½, this was considered Grade I damp. If 1½ and over, this was considered Grade II damp. (For grades of dampness, see Table G5.)

If sooty, and *sooty damp and fog together made up more than half* the lifetime, whichever had the longer period was recorded.

Similarly, if damp and fog, and sooty damp and fog made together more than half the lifetime, the one with the longer period was recorded If all the conditions, excluding clear, together made up *more than half the lifetime, sooty damp and fog was ringed.*

Where the above conditions were not applicable, an additional figure was ringed, meaning "inconsistent locality".

Half the lifetime had to have been spent in an enclosed, an open or an exposed locality before one of these was recorded. Where no one *type had contributed to over half the lifetime a new category meaning* "no consistent type of locality" was recorded.

The same procedure was adopted in determining whether the subject had spent his life in an industrial, a mining, an agricultural, a residential area, or a market town.

The total years of residence recorded on the form was indicated when the "composite" house had been constructed.

Inconsistent locality

Where less than half of the life than had been spent in association with any particular environmental factor, this was recorded as "inconsistent" in that particular respect.

METHOD USED IN EDITING RECORDED INFORMATION RELATING TO OCCUPATION

For the purpose of editing this section, working life was assumed to start at age 14 years

If a subject had been upgraded in the normal way within the same ... recent

itter.

3. "One job only"

... (or as above) for at least ... taken as definitive, and he

4. "Wanderer"

Where a subject had not spent as long as half his working life in any one occupation, he was termed a "Wanderer" and his social class was estimated (I, II, III, IV or V) based upon the occupations recorded.

A "composite" job was then constructed as follows —

The type of occupation, whether heavy, active, light or sedentary, was estimated by an average, weighted according to duration

e g,	Heavy	0	duration	25 yrs	product	0
	Active	1	,,	8 ,,	,,	8
	Light	2	,,	4 ,,	,,	8
	Sedentary	3	,,	18 ,,	,,	54
				55 yrs.	product	70

"Average" type of work $= \frac{70}{55}$ nearer 1 than 2—record "active"

If a subject's occupation involved his working half of the time indoors and half outdoors, this was recorded as an "outdoor" occupation

If he had spent more of his working life underground and at the coalface than above ground, whichever of these (underground or coalface) occupied the greater number of years was recorded

If his underground or coalface work amounted to less than 10 years and the remainder was predominantly outdoor, this was recorded as "outdoor"; if more indoor than out, this was recorded as "indoor"

If his occupations had been predominantly above ground, but included at least 10 years of underground or coalface work, this was recorded as "inconsistent".

Conditions (*General, Draughts, Dust, Fumes, Damp at Work*) If a third or more of the working life had been spent in the unsatisfactory condition, this was recorded as the relevant working condition

Temperature. If two-thirds of the working life had been spent in satisfactory temperature conditions, this was entered as "satisfactory". If only one of the unsatisfactory temperature conditions was men-

condition" was recorded.

The total number of years recorded in the occupations listed was indicated when the "composite" job had been constructed.

5. Type of Occupation

To help to produce a uniform classification, the following examples were given, with a note that the individual's answer is what counts.

Heavy—mechanical driller, roadman, fitter, transport driver, petrol bus driver

Active—housewife, busman, postman, bus conductor.

Light—shop assistant, person working on a production belt, trolley bus driver.

Sedentary—office worker (someone who is sitting down most of the day).

6. Health Visitors' Introductory Letter

DEAR

An enquiry is being undertaken to find out the causes of Chronic Bronchitis, an ailment very common on Tyneside, and one which brings a great deal of distress and sickness to so many people.

Your own doctor knows all about it. Many doctors think it may possibly have much to do with the living and working conditions of the people.

[illegible] th the help of the Health Visitors

All information given will, of course, be treated as private and confidential

Yours very truly,

B1 *Housing Cover*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No	%
Over $\frac{2}{3}$ of total life	198	182	121	199	319	69	381	79
to $\frac{2}{3}$,, ,,	66	52	68	44	134	29	96	20
Under $\frac{1}{3}$,, ,,	8	5	3	3	11	2	8	2
Total	272	239	192	246	464		485	

B2. *Job Cover*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch. Br	Controls	Ch Br	Controls	No	%	No	%
er ¾ working life	268	236	189	242	457	98	478	99
o ¾ ,, ,,	4	2	3	4	7	2	6	1
der ¼ ,, ,,		1					1	
Total	272	239	192	246	464		485	

APPENDIX C

Observer Error

The various possible sources of observer error in diagnosis in this survey are as follows —

(*a*) The Health Visitors' interviewing techniques may differ, so that if they are "working under equivalent conditions with equivalent respondents, they obtain different results" (Gray, 1956)

(*b*) The three examining doctors may have differed similarly (Cochrane *et al*, 1951)

(*c*) The Health Visitors and doctors may have had different standards, so that bronchitics (doctors' standard) may never have reached the doctors

(*d*) Finally, the persons interviewed may have given different answers to the questions on symptoms, independent of the particular questioner.

[illegible] —

the

one who had carried out the examination, for each case individually

(*c*) The Health Visitors were instructed to bring in all doubtful cases for examination, and a matched random sample of their presumptive non-bronchitics was examined

(*d*) The only way to reduce this type of error seemed to be to limit the questions about symptoms to very simple ones Fletcher (1956) has since shown that repeatability of symptoms depends to a large extent upon the particular symptom

The degree of success of these measures is indicated by the following results —

Heavy—mechanical driller, roadman, fitter, transport driver, petrol bus driver

Active—housewife, busman, postman, bus conductor.

Light—shop assistant, person working on a production belt, trolley bus driver.

Sedentary—office worker (someone who is sitting down most of the day)

6. Health Visitors' Introductory Letter

DEAR

An enquiry is being undertaken to find out the causes of Chronic Bronchitis, an ailment very common on Tyneside, and one which brings a great deal of distress and sickness to so many people.

Your own doctor knows all about it Many doctors think it may possibly have much to do with the living and working conditions of the people

All information given will, of course, be treated as private and confidential

Yours very truly,

B1. *Housing Cover*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch. Br	Controls	No	%	No.	%
Over ⅔ of total life	198	182	121	199	319	69	381	79
to ⅔ ,, ,,	66	52	68	44	134	29	96	20
Under ⅓ ,, ,,	8	5	3	3	11	2	8	2
Total	272	239	192	246	464		485	

B2. *Job Cover*

	Males		Females		Total			
	Ch. Br	Controls	Ch Br	Controls	Bronchitics		Controls	
					No	%	No	%
Over ¾ working life	268	236	189	242	457	98	478	99
½ to ¾ ,, ,,	4	2	3	4	7	2	6	1
Under ½ ,, ,,		1					1	
Total	272	239	192	246	464		485	

APPENDIX C

Observer Error

The various possible sources of observer error in diagnosis in this survey are as follows —

(*a*) The Health Visitors' interviewing techniques may differ, so that if they are "working under equivalent conditions with equivalent respondents, they obtain different results" (Gray, 1956)

(*b*) The three examining doctors may have differed similarly (Cochrane *et al*, 1951)

(*c*) The Health Visitors and doctors may have had different standards, so that bronchitics (doctors' standard) may never have reached the doctors

(*d*) Finally, the persons interviewed may have given different answers to the questions on symptoms, independent of the particular questioner.

In planning the survey, these points were carefully considered —

(*a*) The Health Visitors were given a set list of questions

(*b*) A committee of all three doctors discussed the findings of the one who had carried out the examination, for each case individually

(*c*) The Health Visitors were instructed to bring in all doubtful cases for examination, and a matched random sample of their presumptive non-bronchitics was examined

(*d*) The only way to reduce this type of error seemed to be to limit the questions about symptoms to very simple ones Fletcher (1956) has since shown that repeatability of symptoms depends to a large extent upon the particular symptom

The degree of success of these measures is indicated by the following results —

Heavy—mechanical driller, roadman, fitter, transport driver, petrol bus driver.

Active—housewife, busman, postman, bus conductor.

Light—shop assistant, person working on a production belt, trolley bus driver

Sedentary—office worker (someone who is sitting down most of the day).

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The enquiry is being undertaken with the help of the Health Visitors [illegible]

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	Males		Females		Total			
					Bronchitics		Controls	
	Ch. Br	Controls	Ch Br	Controls	No	%	No	%
Over ⅔ of total life	198	182	121	199	319	69	381	79
⅓ to ⅔ ,, ,,	66	52	68	44	134	29	96	20
Under ⅓ ,, ,,	8	5	3	3	11	2	8	2
Total	272	239	192	246	464		485	

B2 *Job Cover*

	Males		Females		Total			
	Ch Br.	Controls	Ch Br	Controls	Bronchitics		Controls	
					No	%	No	%
Over ¾ working life	268	236	189	242	457	98	478	99
½ to ¾ ,, ,,	4	2	3	4	7	2	6	1
Under ½ ,, ,,		1					1	
Total	272	239	192	246	464		485	

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					Bronchitics		Controls	
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Over $\frac{2}{3}$ of total life	198	182	121	199	319	69	381	79
$\frac{1}{3}$ to $\frac{2}{3}$,, ,,	66	52	68	44	134	29	96	20
Under $\frac{1}{3}$,, ,,	8	5	3	3	11	2	8	2
Total	272	239	192	246	464		485	

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	Males		Females		Total			
	Ch Br	Controls	Ch Br	Controls	Bronchitics		Controls	
					No	%	No	%
Over ¾ working life	268	236	189	242	457	98	478	99
¼ to ¾ ,, ,,	4	2	3	4	7	2	6	1
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In p[illegible]

(*a*) [illegible]

(*b*) [illegible]
one wh[illegible]

(*c*) [illegible] for examination, and a matched random sample of their presumptive non-bronchitics was examined

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	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No	%
Over ¾ working life	268	236	189	242	457	98	478	99
¼ to ¾ " "	4	2	3	4	7	2	6	1
Under ¼ " "		1					1	
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[illegible] Health Visitors

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					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No	%
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⅓ to ⅔ " "	66	52	68	44	134	29	96	20
Under ⅓ " "	8	5	3	3	11	2	8	2
Total	272	239	192	246	464		485	

(*a*) The numbers of presumptive bronchitics not confirmed and

significant difference between wards in the confirmation of presumptive bronchitis. No importance is attached to this, as it can be attributed to one particular industrial riverside ward where two-thirds of those not confirmed were cases of "other things" with the appropriate symptoms (mainly bronchiectasis, and tuberculosis), which could only be differentiated from chronic bronchitis on clinical and radiological examination.

There was no significant difference at all between wards in the finding of bronchitis amongst the presumptive controls. ($\chi^2=8\cdot67$, d.f.$=13$, p. 0·75)

The data are given in Table G9 They give every confidence in the uniform standard of ascertainment of the Health Visitors.

(*b*) It was not administratively convenient to assign similar groups to the three examining doctors. Drs CARDOE and ISMAY carried out the hospital examinations, while Dr. OGILVIE did a majority of home visits Of the remaining home visits Dr. Cardoe did more than Dr. . As home visits were often to the aged, the infirm or the reluctant, the groups are not strictly comparable. Even so, there is no significant difference between the doctors in the proportion of presumptive bronchitics or presumptive controls confirmed, in either sex.

Presumptive Bronchitics

(*a*) *Males*	*Confirmed*	*Not Confirmed*	*Total*
Examined by Dr A .	15 (83%)	3	18
Examined by Dr. B .	112 (76%)	35	147
Examined by Dr. C ..	145 (83%)	30	175
	272 (80%)	68	340
(*b*) *Females*			
Examined by Dr. A . .	22 (65%)	12	34
Examined by Dr. B ..	62 (67%)	30	92
Examined by Dr C . .	108 (74%)	38	146
	192 (71%)	80	272

Presumptive Non-bronchitics

(*a*) *Males*	*Confirmed*	*Not Confirmed*	*Total*
Examined by Dr. A ...	61 (81%)	14	75
Examined by Dr. B ...	68 (79%)	18	86
Examined by Dr. C ...	110 (69%)	49	159
	239 (75%)	81	320

(*b*) *Females*

Examined by Dr. A ...	56 (95%)	3	59
Examined by Dr. B ...	84 (94%)	5	89
Examined by Dr. C ..	106 (87%)	16	122
	246 (91%)	24	270

(*c*) The only available evidence on the comparability of answers to [illegible]

questions, and an average of 81·0 per cent. when the questions were asked on separate occasions by a doctor and a Health Visitor

Our results are not directly comparable with these, as confirmation of our diagnosis of chronic bronchitis amounted to agreement on three distinct questions (cough, sputum, duration), while confirmation of the non-bronchitic could be achieved with agreement on any number of the three questions. However, 464 presumptive bronchitics were confirmed, and if a further forty-four whose final diagnosis was bronchiectasis, tuberculosis, or nasal catarrh with the two essential [illegible]

[illegible] per cent. compares well with Fletcher's figures.

The conclusion from sections (*a*), (*b*) and (*c*) above is that no significant bias was introduced by Health Visitors or medical examiners, and that the "error" in our results is (*d*), the inevitable "patient" error in the statement of symptoms.

Final Assessment Sessions

These sessions were attended by all three doctors who took part in the clinical [illegible] responsible for the pro- [illegible] considered thereat. All [illegible] change in diagnosis was made.

In 34 *cases* the change was from "Chronic Bronchitis" to "Other Things" *e.g.* tuberculosis, bronchiectasis, *etc.* (These changes were usually influenced by the chest X-ray, which was not available at the clinical examination.)

In 5 *cases* a diagnosis of "Other Things" was changed to "Chronic Bronchitis."

(*a*) The numbers of presumptive bronchitics not confirmed and presumptive non-bronchitics found to have bronchitis for each Health Visitor were very small. Accordingly the Health Visitors were grouped into the wards of the city in which they worked. There was a just significant difference between wards in the confirmation of presumptive bronchitis. No importance is attached to this, as it can be attributed to one particular industrial riverside ward where two-thirds of those not confirmed were cases of "other things" with the appropriate symptoms (mainly bronchiectasis, and tuberculosis), which could only be differentiated from chronic bronchitis on clinical and radiological examination.

There was no significant difference at all between wards in the finding of bronchitis amongst the presumptive controls. (χ^2=8·67, d.f.=13, p. 0·75.)

The data are given in Table G9. They give every confidence in the uniform standard of ascertainment of the Health Visitors

(*b*) It was not administratively convenient to assign similar groups to the three examining doctors. Drs. CARDOE and ISMAY carried out the hospital examinations, while Dr. OGILVIE did a majority of home visits Of the remaining home visits Dr. Cardoe did more than Dr. Ismay As home visits were often to the aged, the infirm or the reluctant, the groups are not strictly comparable Even so, there is no significant difference between the doctors in the proportion of presumptive bronchitics or presumptive controls confirmed, in either sex

Presumptive Bronchitics

(*a*) *Males*		*Confirmed*	*Not Confirmed*	*Total*
Examined by Dr. A	.	15 (83%)	3	18
Examined by Dr. B	..	112 (76%)	35	147
Examined by Dr. C	..	145 (83%)	30	175
		272 (80%)	68	340

(*b*) *Females*				
Examined by Dr A	...	22 (65%)	12	34
Examined by Dr B	. .	62 (67%)	30	92
Examined by Dr. C	.	108 (74%)	38	146
		192 (71%)	80	272

Presumptive Non-bronchitics

(*a*) *Males*		*Confirmed*	*Not Confirmed*	*Total*
Examined by Dr. A	...	61 (81%)	14	75
Examined by Dr. B	..	68 (79%)	18	86
Examined by Dr. C	...	110 (69%)	49	159
		239 (75%)	81	320

In 2 *cases* a diagnosis of "Chronic Bronchitis" was changed to "No Bronchitis".

In 2 *cases* a diagnosis of "No Bronchitis" was changed to "Chronic Bronchitis".

C1. *Age/Sex Distribution of Refusals*

	Age									
	30		40		50		60		70 & over	
	M.	F	M	F.	M.	F.	M.	F.	M.	F.
'resumptive Chronic Bronchitic Refusals ..	—	1	3	2	5	—	1	1	1	—
;elected Presumptive Control Refusals .. .	1	1	—	4	10	5	6	2	4	1

APPENDIX C: 2

Housing and Job Coverage in Relation to Duration of Disease

Duration of Disease	Housing Coverage						Job Coverage					
	Complete		Over $\frac{2}{3}$		$\frac{1}{3}$ to $\frac{2}{3}$		Complete		Over $\frac{2}{3}$		$\frac{1}{3}$ to $\frac{2}{3}$	
	M	F	M	F.	M	F.	M	F	M	F.	M.	F
Inder 5 years	52	32					52	32				
-9 years	55	32					55	32				
0-14 years	46	35					46	35				
5-19 years	25	19					25	19				
0-29 years	24	28	2	3	1		27	31				
0 years and over	59	36	3	5	5	2	63	42	4			1
ll durations	261	182	5	8	6	2	268	191	4			1

D1. *Males* *The Estimation of Prevalence*

	Age					All ages over 30
	30-39	40-49	50-59	60-69	70 & over	
(i) Population interviewed	447	445	429	298	159	1,776
(ii) Presumptive bronchitics	43	78	111	81	37	350
(iii) % of interviewed (ii)—(i) × 100	9.62	17.53	25.87	27.36	23.27	
(iv) Presumptive bronchitics not examined	0	3	5	1	1	10
(v) Presumptive bronchitics examined (ii) − (iv)	43	75	106	80	36	340
(vi) Presumptive bronchitics assessed bronchitic	31	61	90	64	26	272
(vii) % of examined (vi)—(v) × 100	72.09	81.33	84.91	80.00	72.22	
(viii) % "Confirmed" bronchitics in population $\frac{(iii) \times (vii)}{100}$	6.94	14.26	21.97	21.89	16.81	
(ix) Presumptive non-bronchitics % of interviewed } 100% − (iii)	90.38	82.47	74.13	72.64	76.73	
(x) Presumptive non-bronchitics examined	42	78	92	73	35	320
(xi) Presumptive non-bronchitics assessed bronchitic	10	23	23	12	13	81
(xii) % of examined (xi)—(x) × 100	23.81	29.49	25.00	16.44	37.14	
(xiii) % "Unsuspected" bronchitics in population $\frac{(ix) \times (xii)}{100}$	21.52	24.32	18.53	11.94	28.50	
(xiv) % Total bronchitics in population (viii) + (xiii)	28.5*	38.6*	40.5*	33.8*	45.3*	36.3

* These figures, unreliable in themselves, are used solely for computing the all-ages figure.

for the decades respectively. These differ widely from the figures in table D1, but their (weighted) average for all ages is 30 1 per cent., very similar to that calculated with the separate confirmation rates for the decades of age

For the women, the prevalence must be estimated by the method of table D2, as the chance of a presumptive bronchitic being confirmed on examination depends upon age. Less than half of our youngest age group were confirmed on examination, while seven-eighths of the presumptive women bronchitics over 70 were so confirmed

[illegible] e figures, even [illegible] erall incidence [illegible] ry few of the presumptive non-bronchitics were found to have bronchitis, 8 9 per cent. as compared with the 25 3 per cent in men Even so, in some age groups these "unsuspected" bronchitics contributed more than half of the total bronchitis

In summary, then, the Health Visitor-doctor method of case finding yields unreliable age-incidence figures, but a reliable prevalence figure of 36 per cent. for men of all ages 30 and over and 17 per cent. for the women of the same age.

D3. *The Prevalence of Symptoms in the Sheffield and Newcastle Studies*

Series	Males Age			
	30-39	40-49	50-59	60 & over or 60-69
Sheffield Symptoms E & G*	8 0%	19 3%	27·6%	26 9%
Newcastle Health Visitors ascertainment** .	9 6%	17 5%	25 9%	27 4%

* Persistent cough and sputum (either through the winter or habitually), with or without history of severe breathlessness (Clifton, 1954)

** See text these figures relate to "presumptive bronchitics", not to prevalence checked by medical examination

The age group 70 and over in the Newcastle survey (prevalence 23 3%) is not relevant to this comparison

APPENDIX E

TABLES OF CLINICAL FINDINGS IN 464 CONFIRMED BRONCHITICS AND 485 CONFIRMED CONTROLS

In these tables, results are presented for males and females separately. Total figures are shown when there is no significant difference between the sexes in either group

E1 *Acute Respiratory Episodes*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Episodes annual or more frequent .	179	66	31	13	149	78	34	14
Episodes infrequent ..	93	34	208	87	43	22	212	86
Totals	272		239		192		246	

D2. *Females. The Estimation of Prevalence*

	Age					All ages over 30
	30-39	40-49	50-59	60-69	70 & over	
(i) Population interviewed	467	506	493	346	252	2,064
(ii) Presumptive bronchitics	46	73	76	43	38	276
(iii) % of interviewed (ii)÷(i) × 100 ..	9·85	14·43	15·42	12·43	15·08	
(iv) Presumptive bronchitics not examined	1	2	0	1	0	4
(v) Presumptive bronchitics examined (iii)−(iv)	45	71	76	42	38	272
(vi) Presumptive bronchitics assessed *bronchitic*	21	55	54	29	33	192
(vii) % of examined (vi)÷(v)×100	46·67	77·46	71·05	69·05	86·84	
(viii) % "Confirmed" bronchitics in population $\frac{(iii)\times(vii)}{100}$	4·60	11·18	10·96	8·58	13·10	
(ix) Presumptive non-bronchitics % of interviewed } 100%−(iii)	90·15	85·57	84·58	87·57	84·92	
(x) Presumptive non-bronchitics examined	46	67	76	44	37	270
(xi) Presumptive non-bronchitics assessed bronchitics ..	3	3	8	7	3	24
(xii) % of examined (xi)÷(x)×100 ...	6·52	4·48	10·53	15·91	8·11	
(xiii) % "Unsuspected" bronchitics in population $\frac{(ix)\times(xii)}{100}$	5·88	3·83	8·91	13·93	6·89	
(xiv) % Total bronchitics in population (viii)+(xiii) ..	10·5	15·0	19·9	22·5	20·0	17·0

D3. *The Prevalence of Symptoms in the Sheffield and Newcastle Studies*

Series	Males Age			
	30-39	40-49	50-59	60 & over or 60-69
Sheffield Symptoms E & G*	8.0%	19.3%	27.6%	26.9%
Newcastle Health Visitors ascertainment**	9.6%	17.5%	25.9%	27.4%

* Persistent cough and sputum (either through the winter or habitually), with or without history of severe breathlessness (Clifton, 1954.)

** See text: these figures relate to "presumptive bronchitics", not to prevalence checked by medical examination.

The age group 70 and over in the Newcastle survey (prevalence 23.3%) is not relevant to this comparison.

APPENDIX E

Tables of Clinical Findings in 464 Confirmed Bronchitics and 485 Confirmed Controls

In these tables, results are presented for males and females separately. Total figures are shown when there is no significant difference between the sexes in either group.

E1. *Acute Respiratory Episodes*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Episodes annual or more frequent	179	66	31	13	149	78	34	14
Episodes infrequent	93	34	208	87	43	22	212	86
Totals	272		239		192		246	

E2. *Early Acute Respiratory Episodes*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Recurrent early episodes	43	16	15	6	51	27	19	8
Infrequent early episodes	229	84	224	94	141	73	227	92
Totals	272		239		192		246	

E3. *Persistence of Cough*

Persistence of Cough	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Persistent cough	236	87	45	28 (persistent and seasonal)	140	73	4	5 (persistent and seasonal)
Seasonal cough	35		11		52		9	
No cough reported	1		183		0		233	
Totals	272		239		192		246	

E4. *Persistence of Sputum*

Persistence of Sputum	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Persistent sputum	232	85	18		128	66	2	
Seasonal sputum	40	15	6		63	33	4	
No sputum reported	—		215	90	1		240	98
Totals .	272		239		192		246	

E5 *Colour of Sputum*

…lour of Sputum	Males		Females		Total			
	Ch Br	Controls	Ch Br	Controls	Bronchitics		Controls	
					No	%	No	%
…or Mucoid	161	16	107	4	268	58	20	
.	110	8	84	2	194	42	10	
…tum	—	215	1	240	1		455	94
…een	1	—	—	—	1		—	
…Total .	272	239	192	246	464		485	

E6 (*a*). *Breathlessness*

Breathlessness	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No.	%	No.	%	No	%	No.	%
None	68	25	176	74	21	11	158	64
Intermittent	24	9	5	2	19	10	6	2
Constant	180	66	58	24	152	79	82	33
Totals	272		239		192		246	

E6 (*b*). *Constant Breathlessness*

This symptom is recorded by age, to assist comparison with other surveys

Confirmed Bronchitics

Age	Males			Females		
	Breathless	Not Breathless	Total	Breathless	Not Breathless	Total
30-39	12	19	31	12	9	21
40-49	36	25	61	43	12	55
50-59	67	23	90	46	8	54
60-69	45	19	64	23	6	29
70 and over	20	6	26	28	5	33
30 and over	180	92	272	152	40	192

Presumptive Controls assessed Bronchitic

Age	Males			Females		
	Breathless	Not Breathless	Total	Breathless	Not Breathless	Total
30-39	3	7	10	2	1	3
40-49	9	14	23	3		3
50-59	10	13	23	5	3	8
60-69	9	3	12	6	1	7
70 and over	5	8	13	3		3
30 and over	36	45	81	19	5	24

When these data are used in conjunction with the age distributions of unsuspected bronchitics and confirmed controls, the prevalence of "Newcastle bronchitis with breathlessness" is estimated as 21 1 per cent. amongst men and 13·5 per cent amongst women The calculations follow the same pattern as those of prevalence (table D1)

F7. *Personal Allergic Manifestations*

Personal Allergic History	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No.	%
ent	85	35	75	38	160	34	73	15
nt	187	204	117	208	304	66	412	85
Total	272	239	192	246	464		485	

E8. *Family History of Bronchitis*

Bronchitis in Parents or Sibs	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No.	%	No.	%	No.	%	No.	%
Reported	43	16	20	8	46	24	30	12
Not reported . .	229	84	219	92	146	76	216	88
Total . .	272		239		192		246	

A minor point to be noted here is that even if men's and women's memories of bronchitis in the family are equally satisfactory, we would expect women to have more "family histories of bronchitis" than men. [illegible] are limited to parents and sibs. A man

is a woman.

E9. *Family History of Allergy*

Family Allergic History	Males				Females			
	Bronchitics		*Controls*		*Bronchitics*		*Controls*	
	No	%	No.	%	No.	%	No	%
Present . . .	34	12	26	11	47	24	45	18
Absent	238	88	213	89	145	76	201	82
Total . .	272		239		192		246	

E10. *Progress of the Disease*

Course of Bronchitis	Males		Females	
	Bronchitics		Bronchitics	
	No	%	No.	%
Steadily progressive ..	50	18	40	21
Recent deterioration . .	21	8	37	19
Stationary .. .	188	69	98	51
Improving	13	5	17	9
Total	272		192	

APPENDIX F

F1. *Domestic Situation at time of Survey*

Domestic Situation	Males		Females		Total			
	Ch Br	Controls	Ch. Br	Controls	Bronchitics		Controls	
					No	%	No	%
Living alone ..	16	10	24	21	40	9	31	6
With spouse .	216	199	125	161	341	73	360	74
With relatives ..	35	25	41	63	76	16	88	18
Lodger	5	5	2	1	7	2	6	1
Total ..	272	239	192	246	464		485	

F2 *Health Visitor's Estimate of Domestic Care*

Domestic Care	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br.	Controls	No	%	No	%
Good	224	206	165	222	389	84	428	88
Fair to poor	42	26	23	22	65	14	48	10
Bad	6	7	4	2	10	2	9	2
Total	272	239	192	246	464		485	

F3 *Smoking History—Present Amount smoked*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Cigarettes								
None	30	11	62	26	95	49	177	72
1–5 daily	23	8	8	3	27	14	31	13
6–15 ,,	96	35	69	29	54	28	28	11
16–25 ,,	66	24	44	18	16	8	9	4
26 and over	21	8	12	5			1	
Tobacco								
Under 1 oz weekly	6	2	5	2				
1–3 oz ,,	26	10	32	13				
Over 3 oz ,,	4	1	7	3				
Total	272		239		192		246	

F4. *Greatest Amount ever smoked regularly*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Cigarettes								
None	11	4	29	12	86	45	160	65
1– 5 daily	9	3	7	3	19	10	33	13
6–15 ,,	70	26	52	22	54	28	37	15
16–25 ,,	78	29	60	25	24	13	13	5
26 and over	70	26	44	18	9	5	3	1
Tobacco								
Under 1 oz. weekly	1		5	2				
1–3 oz. ,,	18	7	21	9				
Over 3 oz ,,	15	6	21	9				
Total	272		239		192		246	

F5 *Age Smoking Began*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No.	%	No	%	No	%	No	%
Under 15	93	34	61	26	4	2	3	1
15–19	115	42	95	40	33	17	28	11
20–29	48	18	43	18	30	16	31	13
30–39	4	1	10	4	20	10	14	6
40 +	1		1		19	10	10	4
Non-smokers	11	4	29	12	86	45	160	65
Total	272		239		192		246	

APPENDIX G

"One house only", or "the static population" refer to people who have spent half of their life or more in one house.

"Composite house", or 'the moving population" refer to people who have not spent as much as half of their life in one house and for whom composite housing has been constructed. (See page 79.)

G1. *Type of House*

(a) One house only

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br.	Controls	No.	%	No.	%
Tenement	10	6	6	7	16	12	13	9
Flat	2		2	4	4	3	4	3
Council	4	13	2	7	6	5	20	13
Older terrace	55	46	38	54	93	71	100	66
Semi-detached	6	5	6	9	12	9	14	9
Total	77	70	54	81	131		151	

(b) Composite house

	Males		*Females*		*Total*			
					Bronchitics		Controls	
	Ch. Br.	Controls	Ch Br.	Controls	No.	%	No	%
Tenement	9	7	4	6	13	4	13	4
Flat		1	1	1	1		2	1
Council	7	7	7	4	14	4	11	3
Older terrace	82	74	56	69	138	41	143	43
Semi-detached	7	9	10	16	17	5	25	7
Inconsistent	90	71	60	69	150	45	140	42
Total	195	169	138	165	333		334	

G2 *Rooms for Household*

(a) One house only

Rooms	Males				Females			
	Bronchitics		Controls		Bronchitics		Control	
	No	%	No	%	No	%	No	%
1	1	1	1	1	1	2	1	1
2	18	23	7	10	10	19	12	15
3	21	27	19	27	10	19	19	23
4	26	34	24	34	14	26	20	25
5	2	3	9	13	7	13	16	20
6	7	9	3	4	7	13	6	7
7					3	6	4	5
8	1	1	4	6	1	2	1	1
Over 8	1	1	3	4	1	2	2	2
Total	77		70		54		81	

(b) Composite house

Rooms	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
1	2	1	4	2			3	2
2	27	14	6	4	15	11	12	7
3	74	38	44	26	51	37	52	32
4	60	31	68	40	38	28	51	31
5	26	13	33	20	19	14	29	18
6	5	3	6	4	12	9	11	7
7	1	1	5	3	1	1	5	3
8			1	1	2	1	2	1
Over 8			2	1				
Total	195		169		138		165	

G3. *Persons in Household*

(a) One house only

Persons	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No	%
1	3	4	1	1	7	13	2	2
2	16	21	11	16	7	13	12	15
3	13	17	8	11	9	17	11	14
4	16	21	11	16	6	11	17	21
5	7	9	11	16	10	19	9	11
6	8	10	12	17	2	4	12	15
7	3	4	3	4	4	7	6	6
8	6	8	6	9	4	7		
9	2	3	3	4	2	4	3	4
Over 9	3	4	4	6	3	6	10	12
Total	77		70		54		81	

(b) Composite house

Persons	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No	%
1			4	2	1	1	1	1
2	23	12	11	7	14	10	9	5
3	43	22	28	17	30	22	26	16
4	52	27	52	31	28	20	45	27
5	39	20	41	24	32	23	41	27
6	26	13	17	10	14	10	20	12
7	7	4	10	6	16	12	10	6
8	5	3	5	3	1	1	6	4
9			1	1	2	1	4	2
Over 9								
Total	195		[illegible]		138		165	

G4. *Density of Occupation and Overcrowding amongst Men in composite houses*

Bronchitics

No. of Persons in Household	Rooms for Household 1	2	3	4	5	6	7	8	9	Total Households	Average Persons Per Room
1											
2	1	8	7	6	1					23	0 69
3	1	8	16	12	6					43	0 90
4		4	18	20	9	1				52	1 08
5		2	17	11	7	2				39	1 34
6		2	13	8	1	2				26	1 70
7		2		3	2					7	1 89
8		1	3				1			5	2 22
9											
Total Households	2	27	74	60	26	5	1			195	1 20

Controls—

No of Persons in Household	Rooms for Household 1	2	3	4	5	6	7	8	9	Total Households	Average Persons Per Room
1	2			1			1			4	0 31
2	2	1	1	4	1		1	1		11	0 51
3			12	7	6	3				28	0 75
4		2	9	28	10	2	1			52	0 98
5		2	13	14	11	1				41	1 28
6			5	7	3		1		1	17	1 38
7		1	2	4	2		1			10	1 71
8			2	2					1	5	1 74
9				1						1	2 25
Total Households	4	6	44	68	33	6	5	1	2	169	1 09

The average persons per room is larger for the bronchitics than the controls for each size of house When the numbers of overcrowded

controls appear in the top right hand corner of the rooms-persons table.

G3. *Persons in Household*

(a) One house only

Persons	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No.	%	No	%
1	3	4	1	1	7	13	2	2
2	16	21	11	16	7	13	12	15
3	13	17	8	11	9	17	11	14
4	16	21	11	16	6	11	17	21
5	7	9	11	16	10	19	9	11
6	8	10	12	17	2	4	12	15
7	3	4	3	4	4	7	5	6
8	6	8	6	9	4	7		
9	2	3	3	4	2	4	3	4
Over 9	3	4	4	6	3	6	10	12
Total	77		70		54		81	

(b) Composite house

Persons	*Males*				*Females*			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
1			4	2	1	1	1	1
2	23	12	11	7	14	10	9	5
3	43	22	28	17	30	22	26	16
4	52	27	52	31	28	20	45	27
5	39	20	41	24	32	23	44	27
6	26	13	17	10	14	10	20	12
7	7	4	10	6	16	12	10	6
8	5	3	5	3	1	1	6	4
9			1	1	2	1	4	2
Over 9								
Total	195		169		138		165	

G6 *Atmospheric Conditions*

e house only

Locality	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No	%
r	21	27	25	32	46	35	69	39
y .	31	24	17	26	48	37	60	33
p and Fog	3	5	2	7	5	4	12	8
y, Damp & Fog	22	14	10	16	32	24	30	20
Total ...	77	70	54	81	131		151	

Composite house

Locality	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No	%
ear .	57	67	42	70	99	30	137	41
ooty . .	53	42	42	42	95	29	84	25
amp and Fog	2	3	1	3	3	1	6	2
ooty, Damp & Fog	46	25	23	22	69	21	47	14
nconsistent . .	37	32	30	28	67	20	60	18
Total ...	195	169	138	165	333		334	

G7 *Locality*

) *One house only*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br	Controls	No	%	No	%
Enclosed . . .	54	41	33	46	87	66	87	58
Open	10	29	20	33	39	30	62	41
Exposed	4		1	2	5	4	2	1
Total . .	77	70	54	81	131		151	

G5. *Dampness*

(*a*) *One house only*

	Males		Females		Total			
	Ch Br.	Controls	Ch Br	Controls	*Bronchitics*		*Controls*	
					No.	%	No	%
Dry	59	56	45	64	104	79	120	79
Grade I damp	14	10	7	13	21	16	23	15
Grade II damp	4	4	2	4	6	5	8	5
Total	77	70	54	81	131		151	

(*b*) *Composite house*

	Males		Females		Total			
	Ch Br	Controls	Ch Br.	Controls	Bronchitics		Controls	
					No	%	No	%
Dry	149	154	105	148	254	76	302	90
Grade I damp	39	15	30	16	69	21	31	9
Grade II damp	7		3	1	10	3	1	
Total	195	169	138	165	333		334	

Grade I—Dampness moderate and/or localised to 1 or 2 rooms.
Grade II—Dampness obvious and gross and/or not confined to 1 or 2 rooms.

G9. *Prevalence by Area (at time of survey)*

Wards	Sample Population	Presumptive Chronic Bronchitics		Presumptive Chronic Bronchitics Examined	Not Confirmed		Presumptive Non-Bronchitics Examined	Not Confirmed		Total Estimated Incidence
		No	%		No.	%		No	%	%
Scotswood	239	44	18	44	18	41	38	9	24	
Benwell	163	27	17	27	3	11	29	5	17	
Elswick & Armstrong	312	62	20	61	21	34	42	7	17	
Stephenson	256	54	21	52	11	21	38	8	21	
Westgate	177	40	23	39	4	10	29	7	24	
Total Western	1,147	227	20	223	57	26	176	36	20	31 1
St Nicholas	124	28	23	24	5	21	20	3	15	
Sandyford	198	32	16	30	7	23	25	6	24	
Byker	162	22	14	22	3	14	23	3	13	
St Anthonys	220	35	16	34	9	26	32	7	22	
St Lawrence	151	35	23	34	2	6	27	5	19	
Walkergate	214	47	22	46	15	33	28	3	11	
Walker	213	36	17	36	5	14	39	6	15	
Total Eastern	1,282	235	18	226	46	20	194	33	17	28 5
Fenham & Arthur's Hill	494	49	10	49	17	35	74	14	19	
Kenton	255	41	16	41	9	22	40	2	5	
Jesmond	332	34	10	34	8	24	44	8	18	
Heaton	221	24	11	23	4	17	36	6	17	
Dene	135	16	12	16	7	44	26	6	23	
Total Northern	1,437	164	11	163	45	28	220	36	16	22 8
Total Newcastle	3,866	626	16	612	148	24	590	105	18	27 2

(*b*) *Composite house*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br.	Controls	Ch. Br.	Controls	No	%	No	%
Enclosed . .	96	68	66	65	162	40	133	40
Open	41	57	34	65	75	23	122	37
Exposed	2	2		2	2	1	4	1
Inconsistent	56	42	38	33	94	28	75	22
Total	195	169	138	165	333		334	

G8. *Type of Area*

(*a*) *One house only*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br.	Controls	No	%	No.	%
Industrial	55	42	31	48	86	66	90	60
Mining	3	3	3	3	3	2	6	4
Agricultural	2	1	1	1	6	5	2	1
Residential	17	24	19	28	36	27	52	34
Market Town				1			1	1
Total .	77	70	54	81	131		151	

(*b*) *Composite house*

	Males		Females		Total			
					Bronchitics		Controls	
	Ch Br	Controls	Ch Br.	Controls	No	%	No	%
Industrial . .	102	68	70	81	172	52	149	45
Mining	2	1	2		4	1	1	
Agricultural .	2			3	2	1	3	1
Residential	50	62	34	60	84	25	122	37
Market Town . .				1			1	
Inconsistent	39	38	32	20	71	21	58	17
Total .	195	169	138	165	333		334	

H2. *Situation of Work*

(*a*) *One job only (men who had spent more than two-thirds of their life at one job)*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No	%
Outdoor	64	40	58	37	1	1	1	1
Indoor	91	57	92	59	133	99	162	99
Underground	2	1	1	1	—		—	
Coalface	4	2	5	3	—		—	
Total	161		156		134		163	

(*b*) *One job only (men who had spent half, but not as much as two-thirds of their life at one job)*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No.	%
Outdoor	32	65	16	37	1	2	—	
Indoor	11	23	26	61	46	98	68	100
Underground	3	6	—					
Coalface	2	4	1	2				
Inconsistent	1	2	—					
Total	49		43		47		68	

(*c*) *Wanderers*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No	%
Outdoor	30	48	18	45				
Indoor	27	44	20	50	11	100	15	100
Underground								
Coalface	1	2						
Inconsistent	4	6	2	5				
Total	62		40		11		15	

APPENDIX H

"One job only" refers to people who have spent one half or more of their working life (from age 14) in one occupation.

"Wanderers" refers to the remainder, for whom composite working conditions have been constructed.

H1. *Heaviness of Work*

(a) One job only

Job	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No.	%
Heavy . .	89	42	63	32	2	1	2	1
Active .	95	45	92	46	168	93	206	89
Light	13	6	21	11	10	6	1	
Sedentary .	13	6	23	12	1	1	22	10
Total . . .	210		199		181		231	

(b) Wanderers

Job	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No.	%
Heavy .	22	35	15	38			1	7
Active . .	33	53	24	60	8	73	12	80
Light	5	8	1	3	3	27	1	7
Sedentary	2	3					1	7
Total . . .	62	-	40		11		15	

H4. *Draughtiness at Work*

(a) One job only

	Males				Females	
	Bronchitics		Controls		Bronchitics	
	No.	%	No.	%	No	%
Draughts	76	36	49	25	10	6
None	134	64	150	75	171	94
Total	210		199		181	

(b) Wanderers

	Males				Females			
	Bronchitics		Controls		Bronchitics		Co	
	No	%	No	%	No	%	No	
Draughts	20	32	12	30	1	9	1	
None	42	68	28	70	10	91	14	
Total	62		40		11		15	

H5 *Dustiness of Work*

(a) One job only

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Dust	87	41	55	28	5	3	8	3
None	123	59	144	72	176	97	223	97
Total	210		199					

III. General Working Conditions

(a) [illegible]

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No.	%	No.	%	No.	%	No.	%
Satisfactory	260	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Unsatisfactory	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1
Total	[illegible]		[illegible]		[illegible]		[illegible]	

[illegible]

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No.	%	No.	%	No.	%	No.	%
Satisfactory	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100	[illegible]	[illegible]
Unsatisfactory	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]
Total	[illegible]		[illegible]		[illegible]		[illegible]	

H4. *Draughtiness at Work*

(a) One job only

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No.	%	No.	%
Draughts	76	36	49	25	10	6	8	3
None	134	64	150	75	171	94	223	97
Total	210		199		181		231	

(b) Wanderers

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No.	%	No.	%
Draughts	20	32	12	30	1	9	1	7
None	42	68	28	70	10	91	14	93
Total	62		40		11		15	

H5. *Dustiness of Work*

(a) One job only

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No	%	No	%	No	%
Dust	87	41	55	28	5	3	8	97
None	123	59	144	72	176	97	223	
Total	210		199		181			

(*b*) *Wanderers*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No.	%	No	%	No.	%	No	%
Dust	23	37	11	28	1	9		
None	39	63	29	73	10	91	15	100
Total	62		40		11		15	

H6. *Presence of Fumes*

(*a*) *One job only*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No	%
Fumes	54	26	36	18	2	1	2	1
None	156	74	163	82	179	99	229	99
Total	210		199		181		231	

(*b*) *Wanderers*

	Males				Females			
	Bronchitics		Controls		Bronchitics		Controls	
	No	%	No.	%	No	%	No.	%
Fumes	11	18	4	10				
None	51	82	36	90	11	100	15	100
Total	62		40		11		15	

H7. *Dampness at Work*

(a) One job only

	Males				Females			
	Bronchitics		*Controls*		*Bronchitics*		*Controls*	
	No	%	No	%	No	%	No	%
Damp	32	15	21	11	6	3	2	1
Dry	178	85	178	89	175	97	229	99
Total	210		199		181		231	

(b) Wanderers

	Males				Females			
	Bronchitics		Controls		Bronchitics		*Controls*	
	No	%	No	%	No	%	No	%
Damp .. .	8	13	2	5			1	7
Dry	54	87	38	95	11	100	14	93
Total	62		40		11		15	

H8 *Occupations*

Occupational Classification of the Men in the Survey, and of Newcastle upon Tyne C.B. (Males 15 and over, 1951 census)

Registrar General's Orders	Bronchitics %	Controls %	City* %
[illegible]	4	3	3
[illegible]	22	18	21
[illegible]	3	3	3
[illegible]	8	5	4
[illegible]	1	4	3
[illegible]	9	10	12
[illegible]	6	8	9
[illegible]	3	6	5
[illegible]	2	6	9
[illegible]	3	5	10
[illegible]	23	17	—
All other orders	17	13	21
Total	100	100	100

*Census 1% sample data, 1951.

H9. *Social Class*

Social Class Classification of the Men in the Survey, and of Newcastle upon Tyne C B (Males 15 and over, 1951 census)

Social Class	Bronchitics %	Controls %	City %
I Professional	1	6	3
II Intermediate	6	12	12
III Skilled	63	59	58
IV. Semi-skilled	15	14	12
V Unskilled	15	9	15
Total	100	100	100

H10 *Social Class Prevalence of Confirmed Bronchitis (Males)*

communication) (1956).

Social Class	Confirmed Bronchitis*		Standard Mortality Ratio (Age 20-64) 1951†
	Prevalence %	Prevalence Ratio (All males = 100)	
I Professional	5 3	34	33
II Intermediate	9 6	61	53
III Skilled	16 4	104	97
IV. Semi-skilled	15 3	97	103
V Unskilled	22 9	146	172
All Classes	15 8	100	100

* *i.e.*, those admitting the symptoms to Health Visitors, and subsequently confirmed on examination

† Source: Registrar General's Decennial Supplement 1951, Occupational Mortality, Pt 1 (based on 1% sample census data)

H11 *Unemployment in Social Class III Males*

This table shows that the association of the disease with unemployment is not solely due to the unemployed being in the lower social classes

Years of Unemployment	Bronchitics		Controls	
	No	%	No	%
None	122	72	120	86
2-5	28	16	10	7
6-10	15	9	7	5
11 and over	5	3	3	2
Total ..	170	100	140	100

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